U.S. Department of the Interior
Bureau of Land Management
Fish & Wildlife Service

Final Environmental Impact Statement to Consider a Highway Right-of-Way, Amended Habitat Conservation Plan and Issuance of an Incidental Take Permit for the Mojave Desert Tortoise, and Proposed Resource Management Plan Amendments, Washington County, UT

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Glossary

Air Quality Index (AQI): The AQI is an index for reporting daily air quality. It indicates how clean or polluted your air is and what associated health effects might be of concern. The AQI focuses on health effects experienced within a few hours or days after breathing polluted air.

Allotment: An area of land where one or more livestock operators graze their livestock. Allotments generally consist of lands managed by the Bureau of Land Management (BLM) but may also include other Federally managed, State-owned, or private lands. An allotment may include one or more separate pastures. Livestock numbers and periods of use are specified for each allotment.

Ambient noise: Often referred to as background noise, it is all the noise in a given environment.

Analysis area: An area under investigation to determine either adverse or beneficial impacts from a proposed action.

Allotment: An area of land where one or more livestock operators graze their livestock. Allotments generally consist of lands managed by the BLM but may also include other Federally managed, State-owned, or private lands. An allotment may include one or more separate pastures. Livestock numbers and periods of use are specified for each allotment

American Community Survey (ACS): The ACS is compiled by the U.S. Census Bureau and helps local officials, community leaders, and businesses understand the changes taking place in their communities. It is the premier source for detailed population and housing information about our nation.

American Indian Tribe: Any Indian or Alaska Native Tribe, band, nation, pueblo, village, or community that the Secretary of the Interior acknowledges to exist as an Indian Tribe pursuant to the Federally Recognized Indian Tribe List Act of 1994 (Public Law 103-454; 108 Statute 4791; 25 United States Code [U.S.C.] 479a-1.).

Analysis area: An area under investigation to determine either adverse or beneficial impacts from a proposed action.

Animal unit month (AUM)*:* A standardized measurement of the amount of forage necessary for the sustenance of one cow unit or its equivalent for 1 month; used to describe the carrying capacity of a given forage or pasture. The measurement is equivalent to approximately 800 pounds of forage.

Area of Critical Environmental Concern (ACEC): Areas within public lands where special management attention is required to (1) protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes or (2) protect life and safety from natural hazards.

Avoidance areas: Areas with sensitive resource values where rights-of-way would be strongly discouraged. Authorization made in avoidance areas would have to be compatible with the criteria for issuing a right-of-way in the avoidance area.

Before Present (BP): A time scale used mainly in archaeology, geology, and other scientific disciplines to specify when events occurred in the past.

Camping: Unless otherwise specified, camping in this document refers to vehicle-supported camping, whether at developed or dispersed sites.

Casual Use: Any short-term, noncommercial activity that does not cause appreciable damage or disturbance to the public lands, their resources, or improvements and which is not prohibited by closure of the lands to such activities.

Clean Air Act (CAA): The CAA (42 U.S.C. 7401 et seq.) is a comprehensive Federal law that regulates all sources of air emissions. The 1970 CAA authorized the U.S. Environmental Protection Agency to establish National Ambient Air Quality Standards to protect public health and the environment.

Closed: Generally denotes that an area is not available for a particular use or uses; refer to specific definitions found in law, regulations, or policy guidance for application to individual programs.

***Code of Federal Regulations* (CFR):** The official, legal tabulation of regulations directing Federal government activities.

Comprehensive Travel and Transportation Management Plan: A BLM plan that includes the process for planning for and managing access and transportation systems on public lands. The comprehensive plan includes all forms of transportation including travel by foot, horseback, bicycle, and motorized vehicle (motorcycles, off-road vehicles, cars, and trucks).

Conformance: Conformance indicates that a proposed action is specifically provided for in the land use plan or, if not specifically mentioned, is clearly consistent with the goals, objectives, or standards of the approved BLM land use plan.

Contiguous: Lands or legal subdivisions having a common boundary; lands having only a common corner are not contiguous.

Cooperating agency: Assists the lead Federal agency in developing an Environmental Analysis (EA) or Environmental Impact Statement (EIS). The Council on Environmental Quality regulations implementing the National Environmental Policy Act of 1969 (NEPA) defines a cooperating agency as any agency that has jurisdiction by law or special expertise for proposals covered by NEPA. Any Tribe, Federal, State, or local government jurisdiction with such qualifications may become a cooperating agency through an agreement with the lead agency.

Council on Environmental Quality: An advisory council to the President of the United States established by NEPA of 1969. It reviews Federal programs for their effect on the environment, conducts environmental studies, and advises the president on environmental matters.

Covered Activities: To be eligible for incidental take authorization, covered activities must be: (1) otherwise lawful, (2) non-Federal, and (3) under the direct control of the permittee. In the context of this EIS, Habitat Conservation Plan Covered Activities are those otherwise lawful, non-Federal activities that are reasonably certain to take one or more Mojave desert tortoise and for which authorization for such take would be provided by the Incidental Take Permit. Within the Reserve, Covered Activities are very limited. Outside the Reserve, examples of Covered Activities include land clearing, building construction, recreation, agricultural activities, mining, and other lawful activities.

Critical habitat: For listed species, consists of (1) the specific areas within the geographical area occupied by the species at the time they are listed in accordance with the provisions of Section 4 of the Endangered Species Act on which are found those physical or biological features (constituent elements) (a) essential to the conservation of the species, and (b) which may require special management considerations or protection, and (2) specific areas outside the geographical area occupied by the species at the time they are listed in accordance with the provisions of Section 4 of the Endangered Species Act upon a determination by the Secretary of the Interior that such areas are essential for the conservation of the species. Designated critical habitats are described in 50 CFR 17 and 226.

Cultural resources: A definite location of human activity, occupation, or use identifiable through field inventory (survey), historical documentation, or oral evidence. The term includes archaeological, historic, or architectural sites, structures, or places with important public and scientific uses and may include definite locations (sites or places) of traditional cultural or religious importance to specified social and/or cultural groups. Cultural resources are concrete, material places and things that are located, classified, ranked, and managed through the system of identifying, protecting, and using for public benefit. They may be, but are not necessarily, eligible for the National Register of Historic Places.

Cumulative effect (NEPA): The effect on the environment that results from the incremental effect of the action when added to other past, present, or reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

Dispersed camping: Vehicle accessed and supported camping occurring outside of developed campgrounds.

Dispersed recreation: Recreation activities of an unstructured type that are not confined to specific locations such as recreation sites. Example of these activities may be hunting, fishing, off-road vehicle use, hiking, and sightseeing.

Drought: Drought is a protracted period of deficient precipitation resulting in extensive damage to crops, resulting in loss of yield.

Ecoregion: A region where the type, quality, and quantity of environmental resources are generally similar.

Endangered species: Any species that is in danger of extinction throughout all or a significant portion of its range.

Endangered Species Act (ESA): A law enacted in 1973 (16 U.S.C. 1531 et seq.) that provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found.

Enforcement and Compliance History Online (ECHO): The U.S. Environmental Protection Agency's Enforcement and Compliance History Online website is a tool that provides compliance and enforcement information for facilities regulated by the Environmental Protection Agency.

Environmental Impact Statement (EIS)*:* A detailed written statement required by NEPA when an agency proposes a major Federal action significantly affecting the quality of the human environment.

Environmental Justice: Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Ephemeral: A term used to describe a stream that is intermittent or lasts for a short time; this is characteristic of many watersheds in dry, arid, and semi-arid regions.

Erosion: The wearing away of the land surface by running water, wind, ice, or other geological agents.

Exclusion area: Areas with sensitive resource values where rights-of-way would not be authorized.

Exclusion fencing: A barrier to exclude certain types of animals or other users.

Extensive Recreation Management Area (ERMA): ERMAs recognize existing recreation use, demand, or recreation and visitor services program investments and are managed to sustain principal recreation activities and associated qualities and conditions, commensurate with other resource and resource uses. Minimal management actions related to the BLM's stewardship responsibilities are adequate in these areas.

Federal Land Policy and Management Act of 1976 (FLPMA): Often referred to as the BLM's "Organic Act," FLPMA (Public Law 94-579) provides the majority of the BLM's legislated authority, direction, policy, and basic management guidance.

Federal Register: A daily publication that reports presidential and Federal agency documents.

Fire Regime Condition Class (FRCC): An interagency, standardized tool for determining the degree of ecological departure from historical, or reference, vegetation, fuels, and disturbance regimes.

Floodplain: The relatively flat area or lowlands adjoining a body of standing or flowing water, which has been or might be covered by floodwater.

Fossil: Any remains, traces, or imprints of prehistoric, non-human organisms preserved in or on the Earth's crust that provide information about the history of life on Earth.

Goal: A broad statement of a desired outcome. Goals are usually not quantifiable and may not have established timeframes for achievement.

Guidelines: Actions or management practices that may be used to achieve desired outcomes, sometimes expressed as best management practices. Guidelines may be identified during the land use planning process, but they are not considered a BLM land use plan decision unless the plan specifies that they are mandatory.

Habitat: A specific set of physical conditions that surround a species, group of species, or a large community. In wildlife management, the major constituents of habitat are considered to be food, water, cover, and living space.

Habitat Conservation Plan (HCP): A land management tool that seeks to balance the needs of endangered or threatened species with the needs of non-Federal land owners. Under section 10(a)(2)(A) of the Endangered Species Act, a planning document that is a mandatory component of an incidental take permit application, also known as a conservation plan.

Habitat fragmentation: The disruption (by division) of extensive habitats into smaller habitat patches. The effects of habitat fragmentation include loss of habitat area and the creation of smaller, more isolated patches of remaining habitat.

Historic property: Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian Tribe or Native Hawaiian organization and that meet the National Register of Historic Places criteria (36 CFR 800.16(l)(1)).

Impact: A modification of the existing environment caused by an action. These environmental consequences are the scientific and analytical basis for comparison of alternatives. Impacts, also referred to as effects, may be either direct (caused by the action and occur at the same time and place) or indirect (caused by the action and occurring later in time or farther removed in distance, but still reasonably foreseeable or cumulative).

Incidental Take Permit (ITP): A permit issued to non-Federal entities undertaking otherwise lawful projects that might result in the take of an endangered or threatened species. Application for an incidental take permit is subject to certain requirements including preparation by the permit applicant of a conservation plan, generally known as a Habitat Conservation Plan (HCP).

Interior Board of Land Appeals (IBLA): An appellate review body that exercises the delegated authority of the Secretary of the Interior to issue final decisions for the Department of the Interior.

Intergovernmental Panel on Climate Change (IPCC): The United Nations body for assessing the science related to climate change. The IPCC was created to provide policymakers with regular scientific assessments on climate change, its implications, and potential future risks and to put forward adaptation and mitigation options.

Invasive species: A species that is not native to a specific location and that has a tendency to spread to a degree believed to cause damage to the environment, human economy, or human health.

Key Observation Point (KOP): A representative viewpoint where the project would be prominently visible. KOPs are typically used in the preparation of realistic visual simulations and the evaluation of potential impacts to views and viewers.

Land and Water Conservation Fund Act of 1965: Federal law passed to create and maintain a nationwide legacy of high-quality recreation areas and facilities and to stimulate non-Federal investments in the protection and maintenance of recreation resources across the United States.

Land use plan: Also referred to as resource management plan, a BLM land use plan as prescribed by the Federal Land Policy and Management Act that establishes, for a given area of land, land use allocations, coordination guidelines for multiple use, objectives, and actions to be achieved.

Landscape Unit (LU): A visual analysis term used by the Federal Highway Administration to define visually homogenous viewsheds and landscape types.

Management decision: A decision made by the BLM to manage public lands. Management decisions are made on both the BLM land use plan decisions and implementation decisions.

Mechanized travel: Travel by use of a machine, either motorized or non-motorized.

Migratory Bird Treaty Act (MBTA): A law that makes it illegal to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird or the parts, nests, or eggs of such a bird except under the terms of a valid Federal permit.

Minimize: To reduce the adverse impact of an operation to the lowest practical level.

Mitigation measures: Methods or procedures that reduce or lessen the impacts of an action.

Mojave desert tortoise: A species of tortoise that occurs north and west of the Colorado River in California, Nevada, Arizona, and Utah, and is listed as a threatened species.

National Conservation Area (NCA): A designation for certain protected areas in the United States managed by the BLM's National Conservations Lands program.

National Environmental Policy Act of 1969 (NEPA): An act that establishes the broad national framework for protecting our environment with a policy to assure that all branches of government give proper consideration to the environment prior to undertaking any major Federal action that significantly affects the environment. NEPA encourages productive and enjoyable harmony between man and his environment and promotes efforts to prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man, enriches the understanding or the ecological systems and natural resources important to the Nation, and establishes the Council on Environmental Quality.

National Historic Preservation Act (NHPA): The National Historic Preservation Act of 1966 is Federal legislation enacted to preserve historical and archaeological sites in the United States.

Natural Resources Conservation Service (NRCS): Formerly known as the Soil Conservation Service, the NRCS is an agency of the United States Department of Agriculture that provides technical assistance to farmers and other private landowners and managers.

National Register of Historic Places (NRHP): The official list of the Nation's historic places worthy of preservation for their historical significance. Authorized by the NHPA, the National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect America's historic and archaeological resources.

Non-mechanized travel: Travel by foot or on an animal.

Notice to Proceed: Issued to begin and carry on an action, process, or movement.

Noxious weeds: A plant species designated by Federal of State law as generally possessing one or more of the following characteristics: aggressive and difficult to manage; parasitic; a carrier or host of serious insects or disease; or non-native, new, or not common to the United States.

Objective: A description of a desired condition for a resource. Objectives can be quantified and measured and, where possible, have established time frames for achievement.

Off-highway vehicle (OHV): Any motorized vehicle capable of, or designed for, travel on or immediately over land, water, or other natural terrain, excluding (1) any nonamphibious registered motorboat, (2) any military, fire, emergency, or law enforcement vehicle while being used for emergency purposes, (3) any vehicle whose use is expressly authorized by the Authorized Officer, or otherwise officially approved, (4) vehicles in official use, and (5) any combat or combat support vehicle when used in times of national defense emergencies.

Omnibus Public Lands Management Act (OPLMA): OPLMA of 2009 is a land management law that resulted in the designation of millions of acres in the United States as protected and established a National Landscape Conservation System. In the context of this EIS, the Act established Red Cliffs National Conservation Area in Washington County, which is managed by the BLM. OPLMA also is relevant to this EIS in its directive to identify (a) alternative(s) for a northern transportation route in the County.

Open: Generally denotes that an area is available for a particular use or uses. Refer to specific program definitions found in law, regulations, or policy guidance for application to individual programs.

Paleontological resources (fossils): Any fossilized remains, traces, or imprints of organisms, preserved in or on the Earth's crust, that are of paleontological interest and that provide information about the history of life on Earth.

Paleontology: The scientific study of prehistoric life based on the fossil record.

Perennial plant: A plant that lives for more than 2 years.

Perennial water: A perennial stream or river is one that has continuous flow in parts of its stream bed all year round during years of normal rainfall.

Permitted Use: Any use that requires a permit or other special authorization.

Plan of Development: A document required to be submitted by an Applicant for a right-of-way across BLM-administered lands that describes the proposed project, lands required, construction techniques, design features of the proposed project, and other information about the construction, operation, and maintenance of the project.

Planning Area: A geographical area, including all land ownerships, for which the BLM land use and resource management plans are developed and maintained for the BLM-administered lands within that geographical area.

Public land: Land or interest in land owned by the United States and administered by the Secretary of the Interior through the BLM.

Rangeland: Land used for grazing by livestock and big game animals on which vegetation is dominated by grasses, grass-like plants, forbs, or shrubs.

Raptor: Bird of prey with sharp talons and strongly curved beaks such as hawks, owls, vultures, and eagles.

Record of Decision: A document signed by a responsible official recording a decision that was preceded by the preparation of an EIS.

Recreation Management Zone (RMZ): A subdivision of a Special Recreation Management Area used to further delineate specific recreation opportunities and recreation setting characteristics.

Regional Transportation Plan: A long-term blueprint of a region's transportation system. Usually Regional Transportation Plans are conducted every 5 years and are plans for 30 years into the future, with the participation of dozens of transportation and infrastructure specialists. The plan identifies and analyzes transportation needs of the metropolitan region and creates a framework for project priorities.

Resource use: Human uses of resources for the social and economic benefit of society, including mining, energy production, livestock production (grazing), recreation (motorized, non-motorized), forest production (timber, fire wood, fence posts), utility corridors (power lines, pipelines, roads), and communication sites. BLM land use plans identify allowable uses of the public lands and set goals and objectives for desired outcomes for resource uses.

Resource: The natural, biological, and cultural components of the environment, including air, soil, water, vegetation, wildlife, minerals, historic and prehistoric (cultural) sites and features, and fossils. Land use plans set goals and objectives for desired outcomes for management of the various resources in a planning area.

Resource Management Plan: See Land Use Plan definition.

Right-of-way (ROW) grant: A ROW grant is an authorization to use a specific piece of BLM-administered public land for a specific project. The grant authorizes rights and privileges for a specific use of the land for a specific period of time.

Riparian area: A form of wetland transition between permanently saturated wetlands and upland areas. Riparian areas exhibit vegetation or physical characteristics that reflect the influence of permanent surface or subsurface water. Typical riparian areas include lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and streams, glacial potholes, and the shores of lakes and reservoirs with stable water levels. Excluded are ephemeral streams or washes that lack vegetation and depend on free water in the soil.

Route: A linear line for motorized, mechanized, or non-mechanized travel.

Scenic byways: Highway routes, which have roadsides or corridors of special aesthetic, cultural, or historic value. An essential part of the highway is its scenic corridor. The corridor may contain outstanding scenic vistas, unusual geologic features, or other natural elements.

Scoping: The process of identifying the range of issues, management concerns, preliminary alternatives, and other components of an EIS or land use planning document.

Section 106 compliance: The requirement of Section 106 of the NHPA that any project funded, licensed, permitted, or assisted by the Federal government be reviewed for impacts to significant historic properties and that the State Historic Preservation Officer and the Advisory Council on Historic Preservation be allowed to comment on a project.

Section 7: The section of the Endangered Species Act of 1973, as amended, outlining procedures for interagency cooperation to conserve Federally listed species and designated critical habitats. Section 7(a)(1) requires Federal agencies to use their authority to further the conservation of listed species. Section 7(a)(2) requires Federal agencies to consult with the services to ensure they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat.

Sensitive species: Bureau sensitive species include all Federal candidate species, proposed species, and delisted species in the 5 years following delisting.

Slope: The degree of deviation of a surface from the horizontal.

Special Recreation Management Area (SRMA): Areas that require explicit recreation management to achieve recreation objectives and provide specific recreation opportunities.

Special Recreation Permit: Special Recreation Permits are issued to businesses, organizations, and individuals to allow the use of specific public land and related waters for commercial, competitive, and organized group use. Special Recreation Permits allow land management agencies to coordinate and track commercial and competitive use of public lands. They also provide resource protection measures to ensure the future enjoyment of those resources by the public.

Special status species: Includes proposed species, listed species, and candidate species under the Endangered Species Act; State-listed species; and BLM State Director-designated sensitive species. As defined in the BLM Manual 6840-Special Status Species Policy, the BLM special status species are (1) species listed or proposed for listing under the Endangered Species Act and (2) species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the Endangered Species Act, which are designated as Bureau sensitive by the State Director(s).

State of Utah School and Institutional Trust Lands Administration (SITLA): SITLA was created in 1994 to manage the 3.4 million acres of trust land, generating revenue for State public institutions.

Stipulations: Requirements that are part of the terms of a BLM land use approval. Some stipulations are standard on all approvals. Other stipulations may be applied to the authorization at the discretion of the BLM to protect valuable surface resources and uses.

Surface disturbance: Activities that normally result in more than negligible disturbance to public lands and that accelerate the natural erosive process. These activities normally involve use and/or occupancy of the surface, cause disturbance to soils and vegetation, and are usually caused by motorized or mechanical actions. Surface disturbance may result from activities using earth-moving equipment; off-road vehicle travel; the use of pyrotechnics and explosives; and construction of facilities like power lines, pipelines, recreation sites, livestock facilities, wildlife waters, or new roads. Surface disturbance is not normally caused by casual use. Activities that are not typically surface-disturbing include, but are not limited to, proper livestock grazing, cross-country hiking, minimum impact filming and vehicle travel on designated routes.

Take: According to Section 3(18) of the Endangered Species Act, the term 'take' means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

Threatened species: Any plant or animal species defined under the Endangered Species Act as likely to become endangered within the foreseeable future throughout all or a significant portion of its range; listings are published in the Federal Register.

Transportation Improvement Plan: Each metropolitan planning organization is required, under 49 U.S.C. 5303(j), to develop a Transportation Improvement Program—a list of upcoming transportation projects—covering a period of at least 4 years. The Transportation Improvement Plan must be developed in cooperation with the State and public transit providers.

Undertaking: (54 U.S.C. 300320): A project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; those requiring a Federal permit, license or approval; and those subject to State or local regulation administered pursuant to a delegation or approval by a Federal agency.

Utility or ROW corridor: A parcel of land that has been identified by law or Secretarial order, through a land use plan, or by other management decision as being the preferred location for existing and future ROW grants and suitable to accommodate one type of ROW or one or more ROWs which are similar, identical or compatible.

Vegetation type: A plant community with distinguishable characteristics described by the dominant vegetation present.

Visual resources: The visible physical features of a landscape (topography, water, vegetation, animals, structures, and other features) that constitute the scenery of an area.

Visual resource management (VRM) classes: Classification of landscapes according to the types of structures and changes acceptable to meet established visual goals.

Waters of the United States (WOUS): All bodies of water that fall under the Federal jurisdiction of the Clean Water Act.

Water quality: The chemical, physical, and biological characteristics of water with respect to its suitability for a particular use.

Watershed: All lands that are enclosed by a continuous hydrologic drainage divide and lay upslope from a specified point on a stream.

Wetlands: Areas where water covers the soil or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season. Water saturation (hydrology) largely determines how the soil develops and the types of plant and animal communities living in and on the soil. Wetlands may support both aquatic and terrestrial species. The prolonged presence of water creates conditions that favor the growth of specially adapted plants (hydrophytes) and promote the development of characteristic wetland (hydric) soils.

Wilderness: A Congressionally designated area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, that is protected and managed to preserve its natural conditions as described in Section 2A of the Wilderness Act of 1964.

Wildfire: Unplanned ignition of a wildland fire (such as a fire caused by lightning, volcanoes, and unauthorized and accidental human-caused fires) and escaped prescribed fires.

Wildland fire: A general term describing any non-structure fire that occurs in the wildland.

Woodland: A forest community occupied primarily by noncommercial species such as juniper, mountain mahogany, or quaking aspen groves; all western juniper forestlands are classified as woodlands, as juniper is classified as a noncommercial species.

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Appendix A: List of References

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Appendix A. List of References

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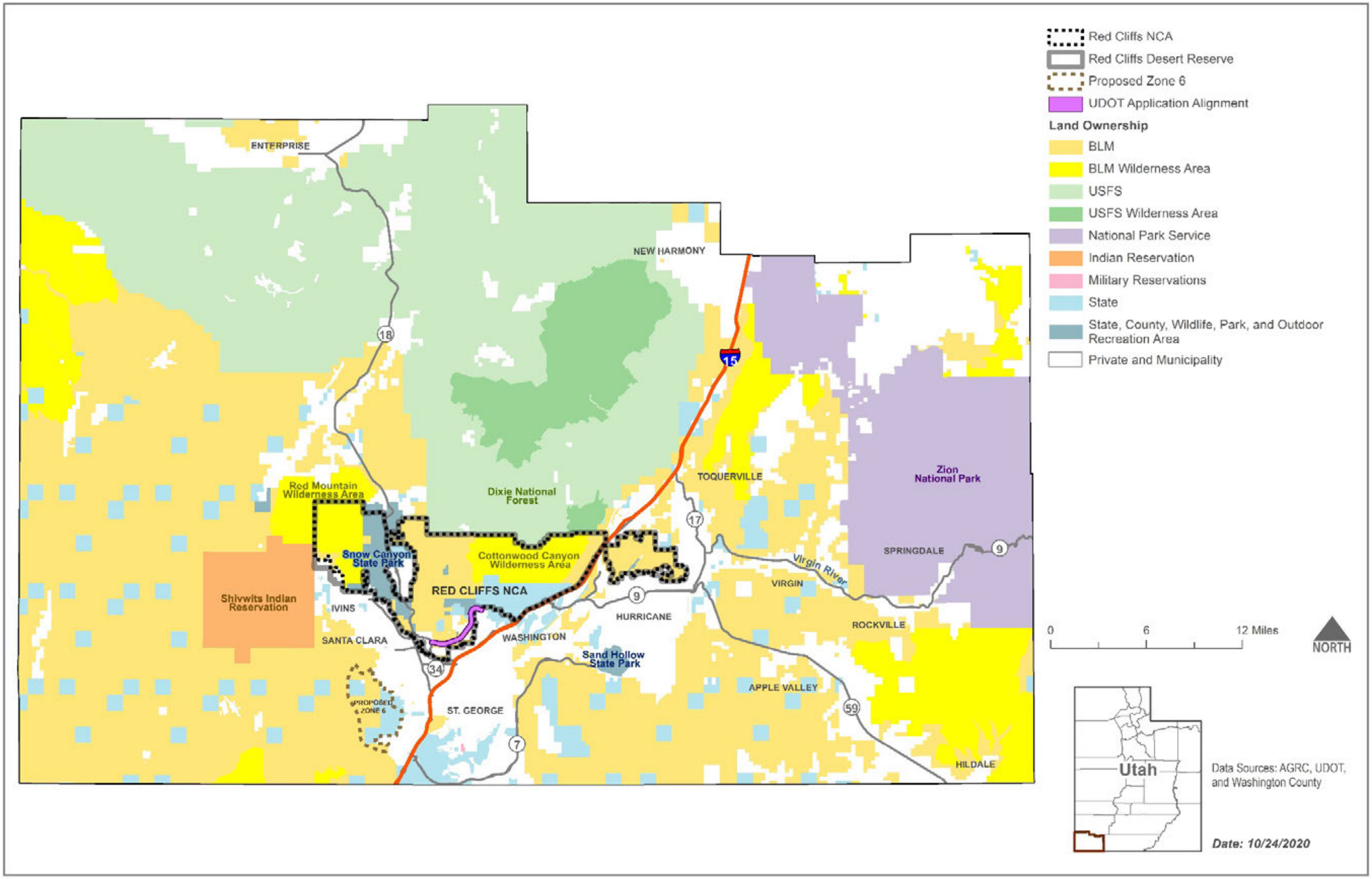
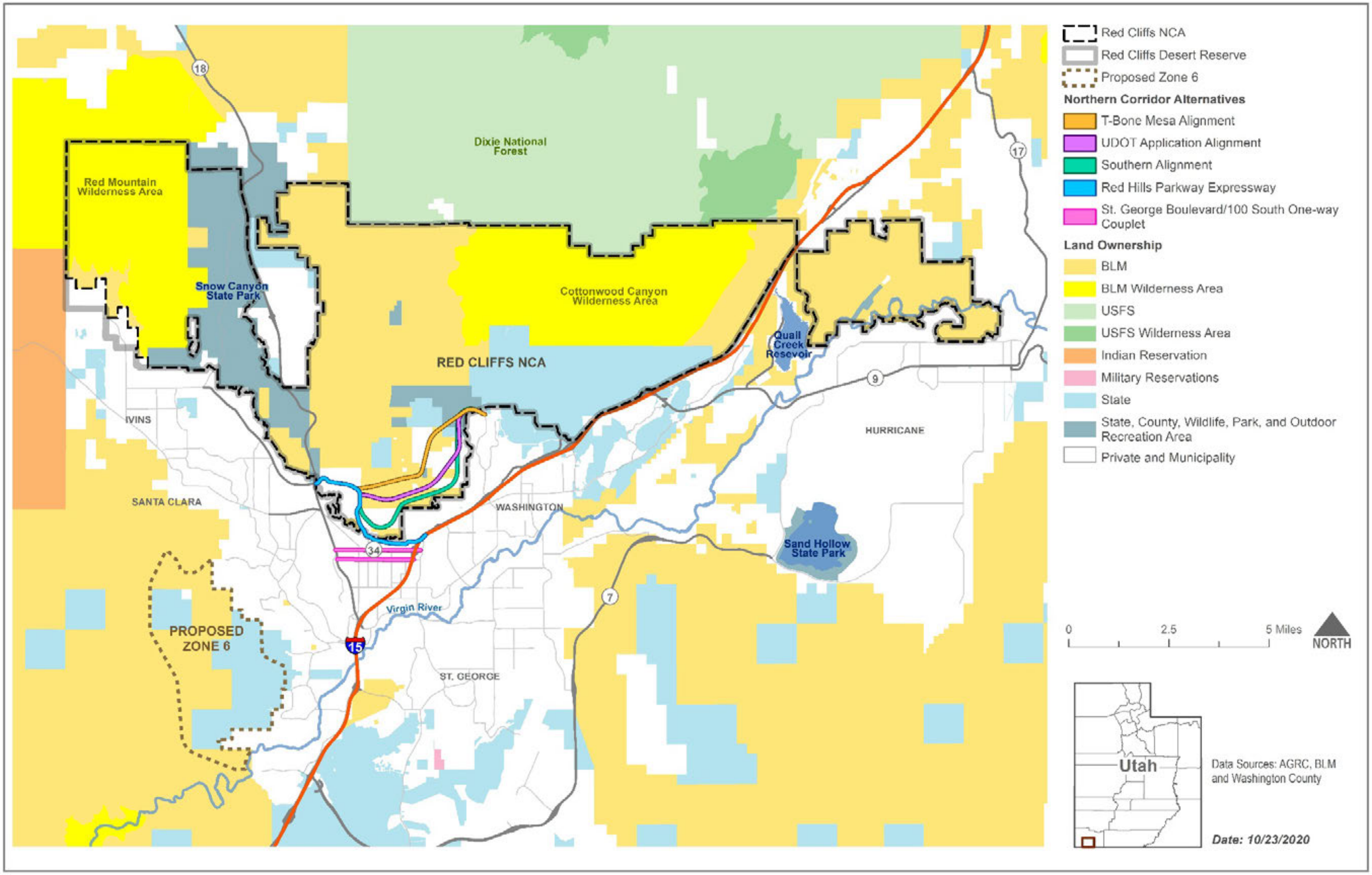
Appendix B: Maps

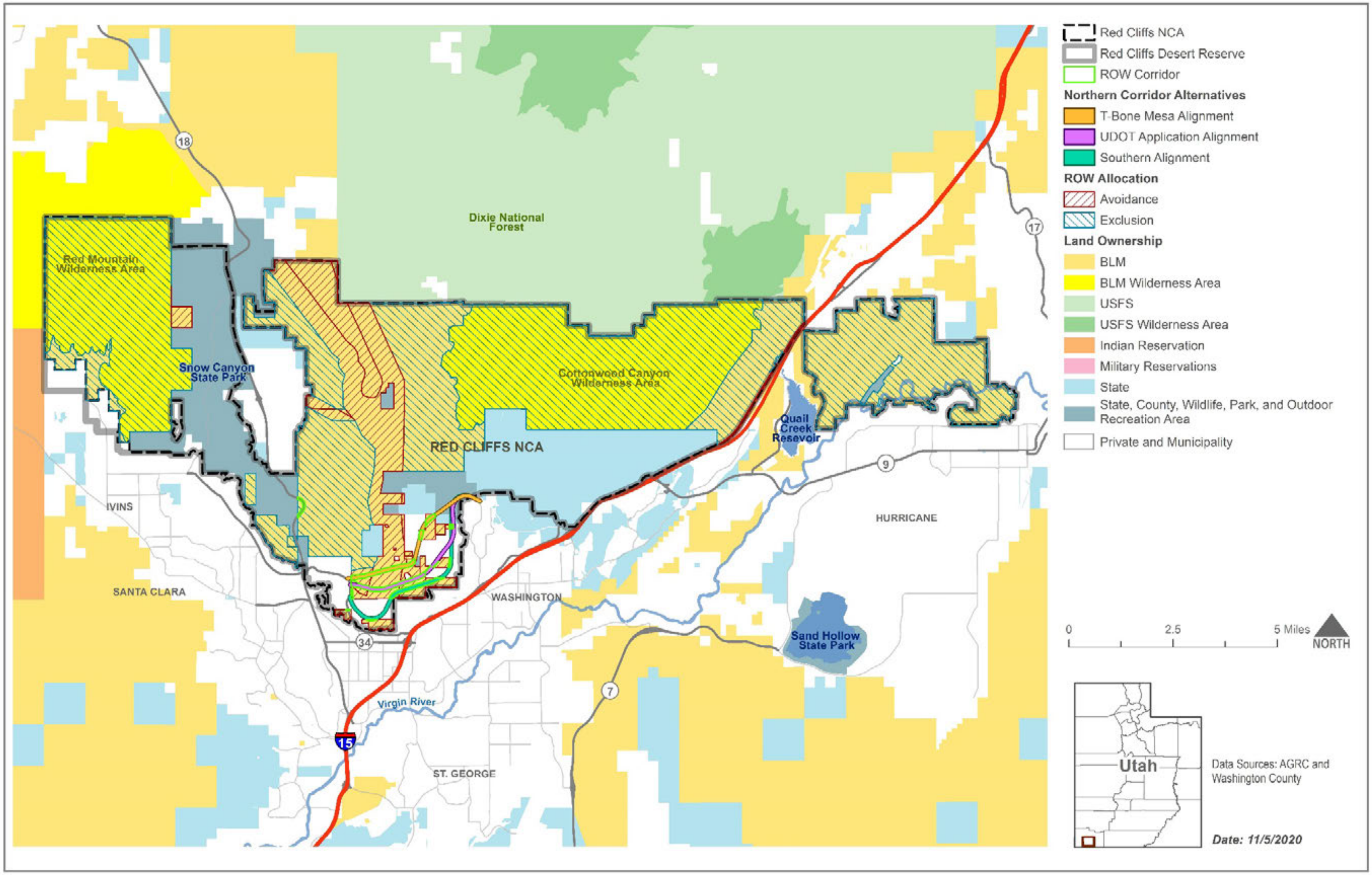
Map 1.1-1. Planning Area for the Northern Corridor Project



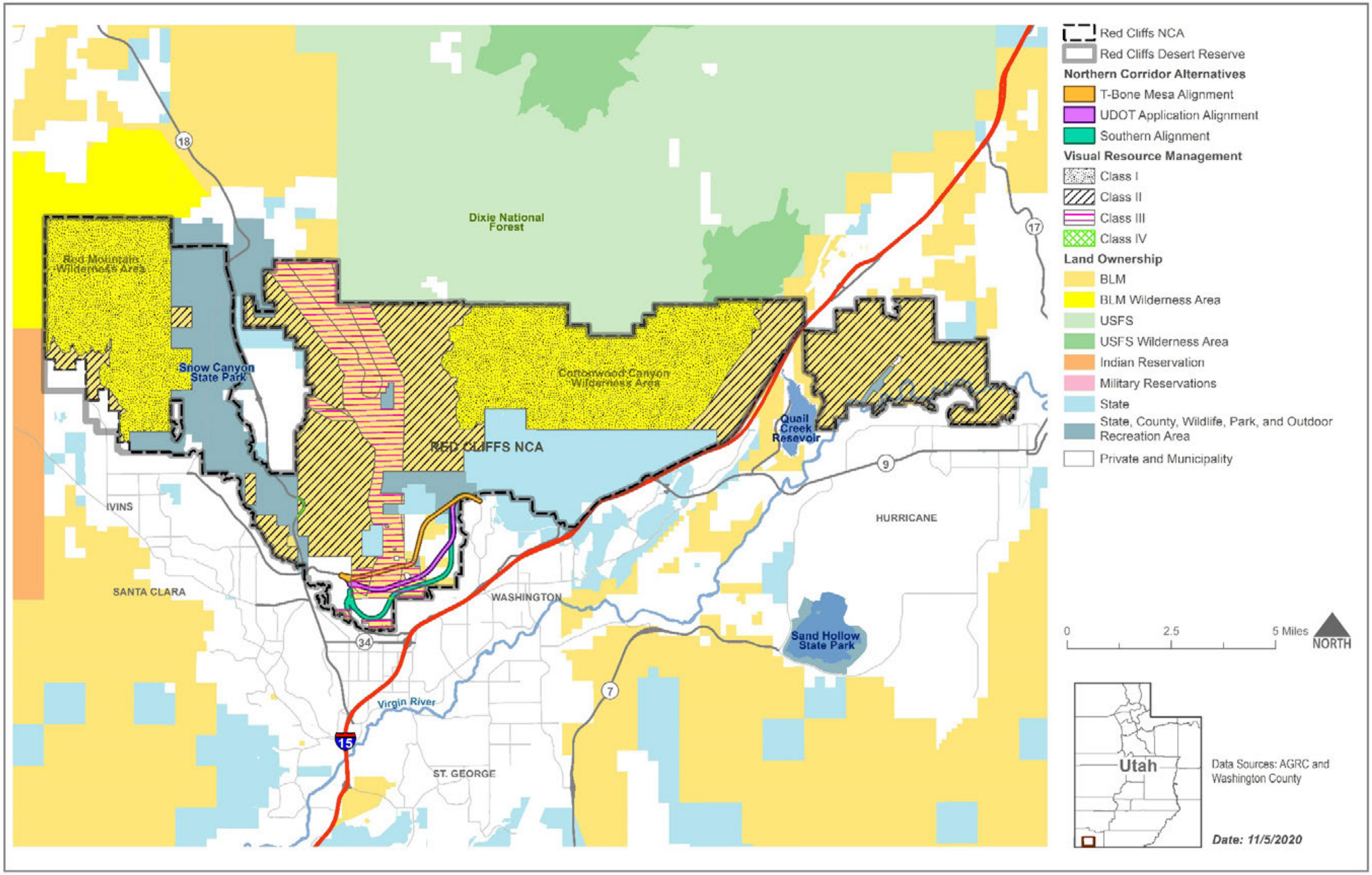
Map 2.2-1. Northern Corridor Alternatives Considered in Detail



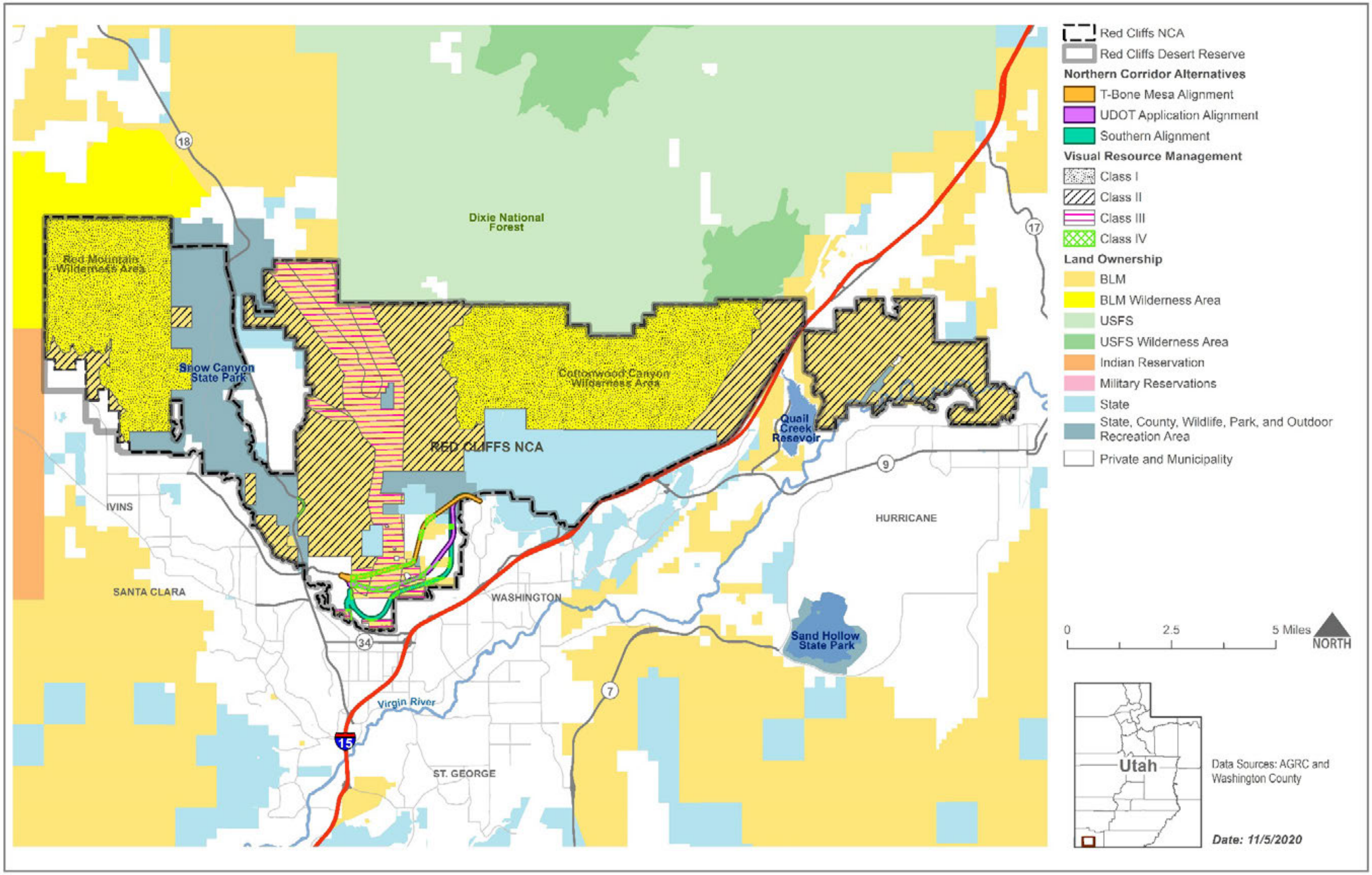
Map 2.3-1. Red Cliffs NCA: Right-of-way Avoidance and Exclusion Areas – Amendment Alternative Locations



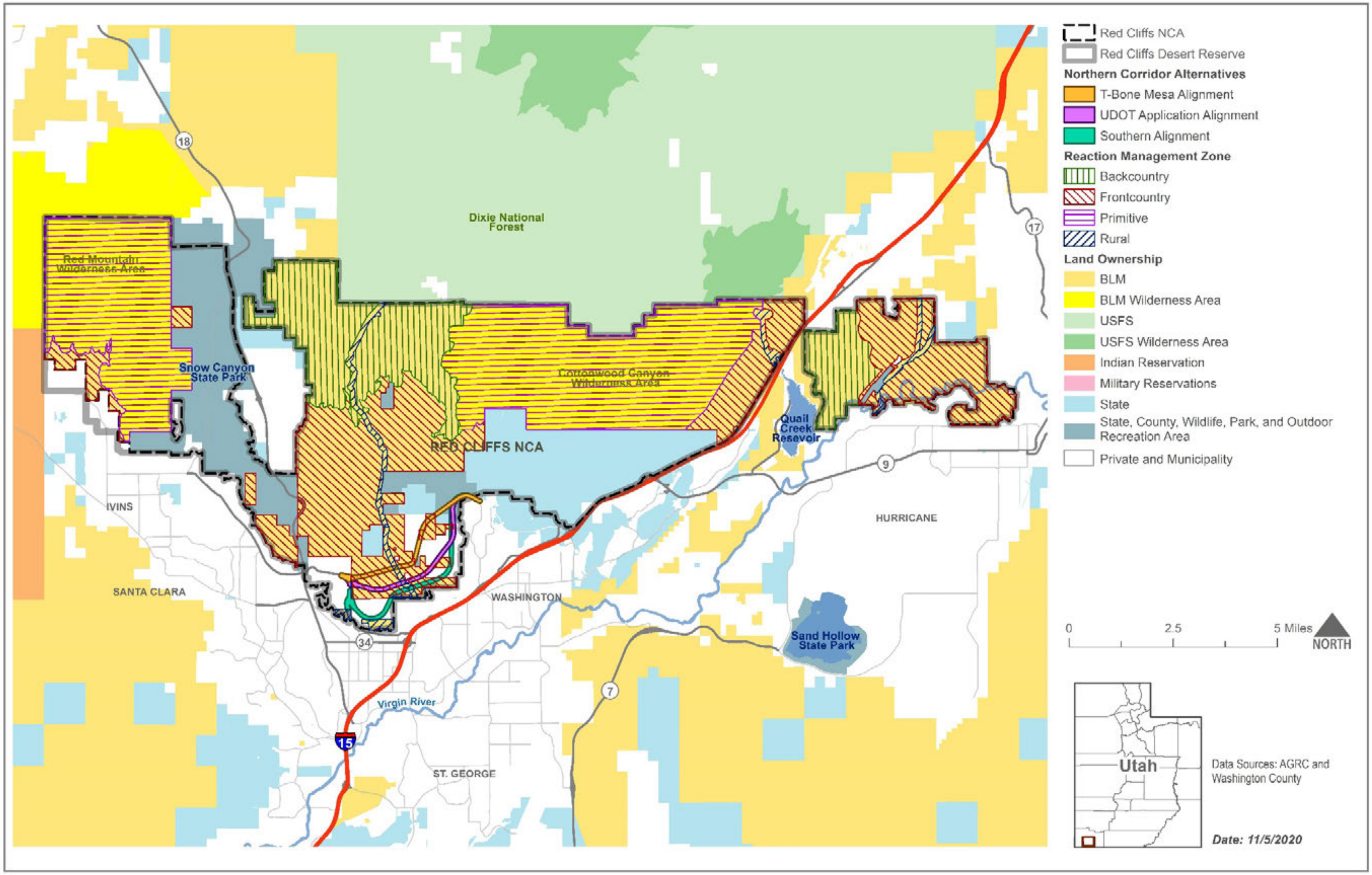
Map 2.3-2. Red Cliffs NCA: VRM Classes – Red Cliffs NCA RMP Amendment Alternative A



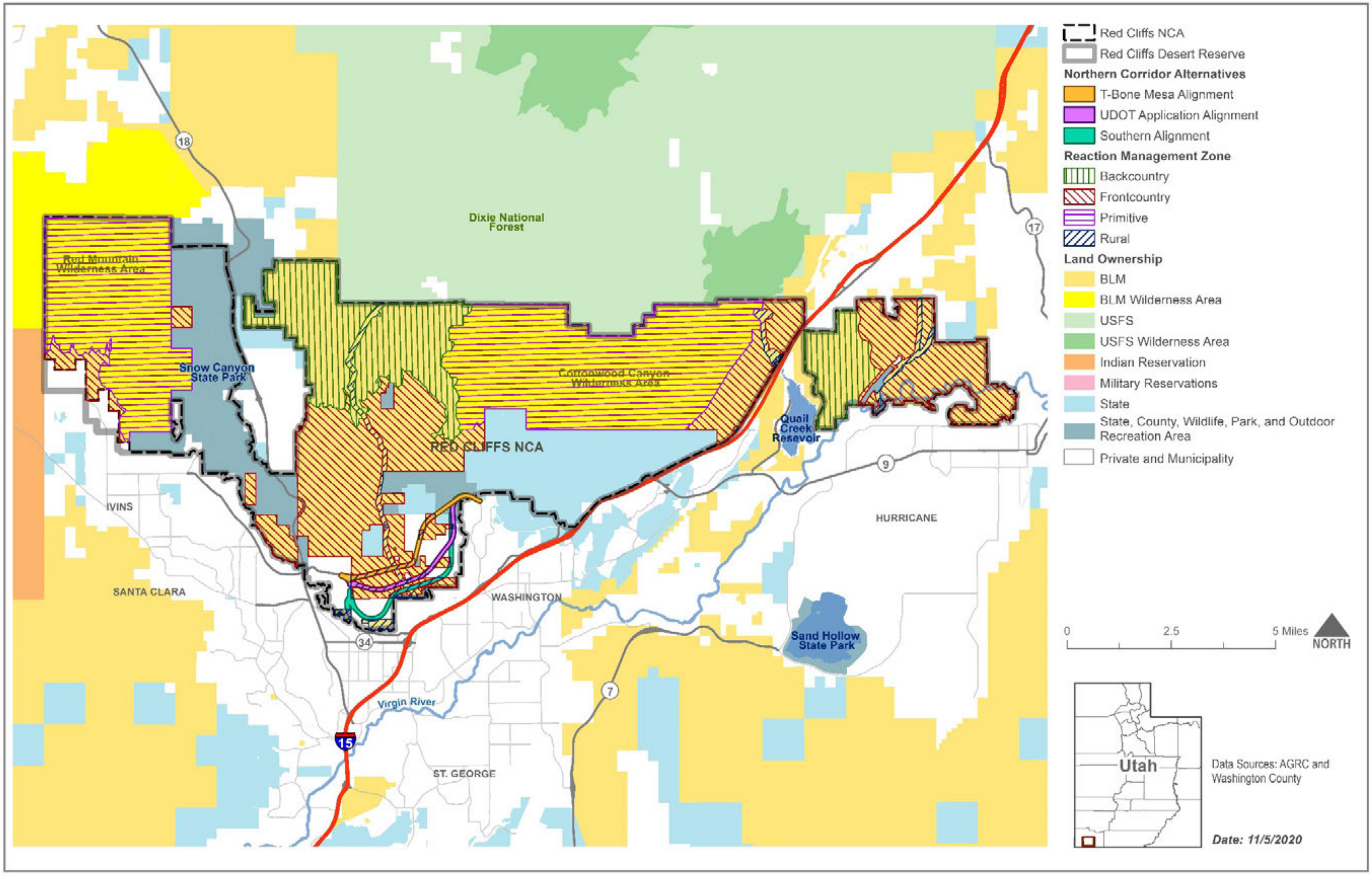
Map 2.3-3. Red Cliffs NCA: VRM Classes – Red Cliffs NCA RMP Amendment Alternatives B and C



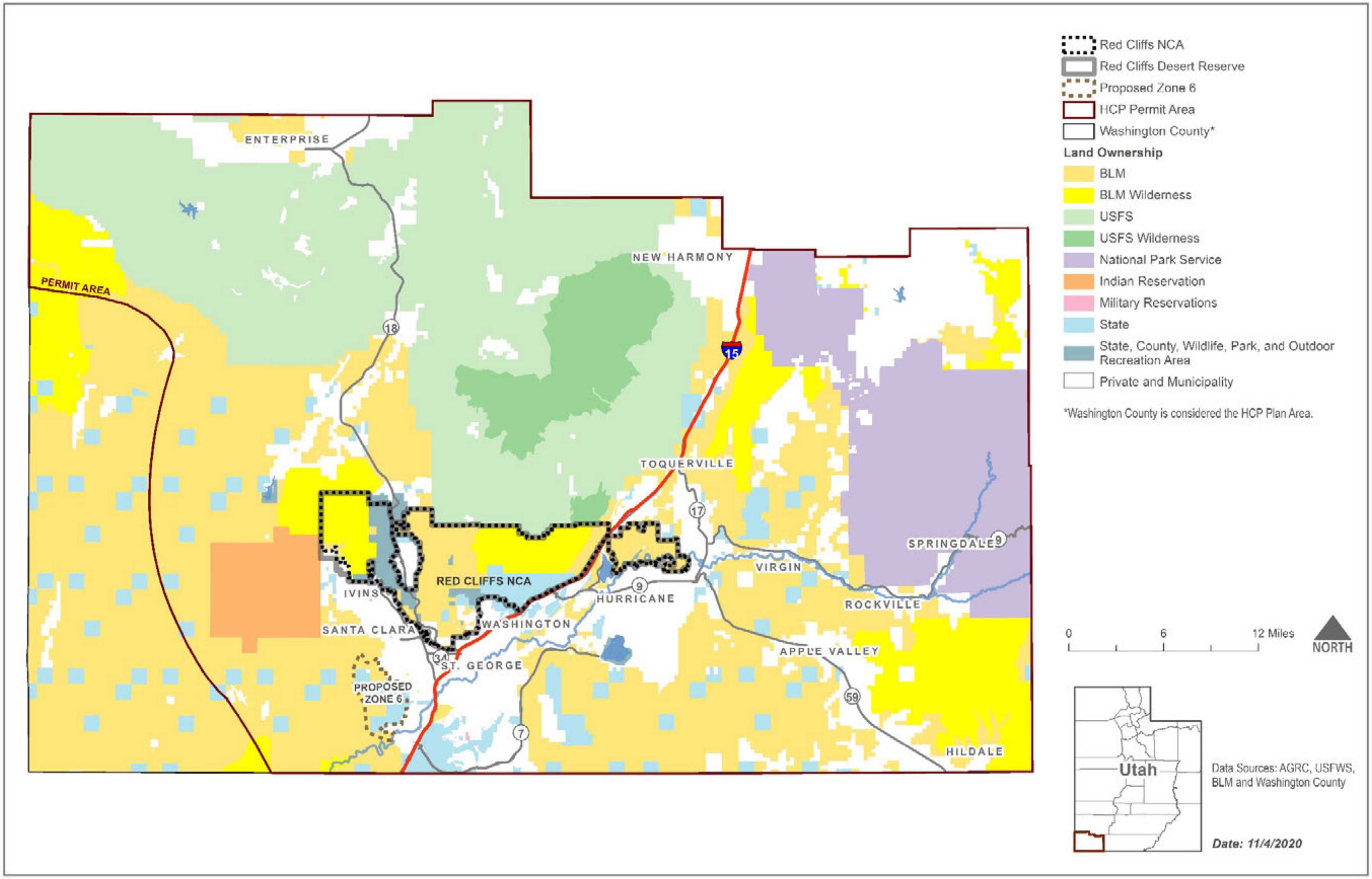
Map 2.3-4. Red Cliffs NCA: Recreation Management Zones – Red Cliffs NCA RMP Amendment Alternative A



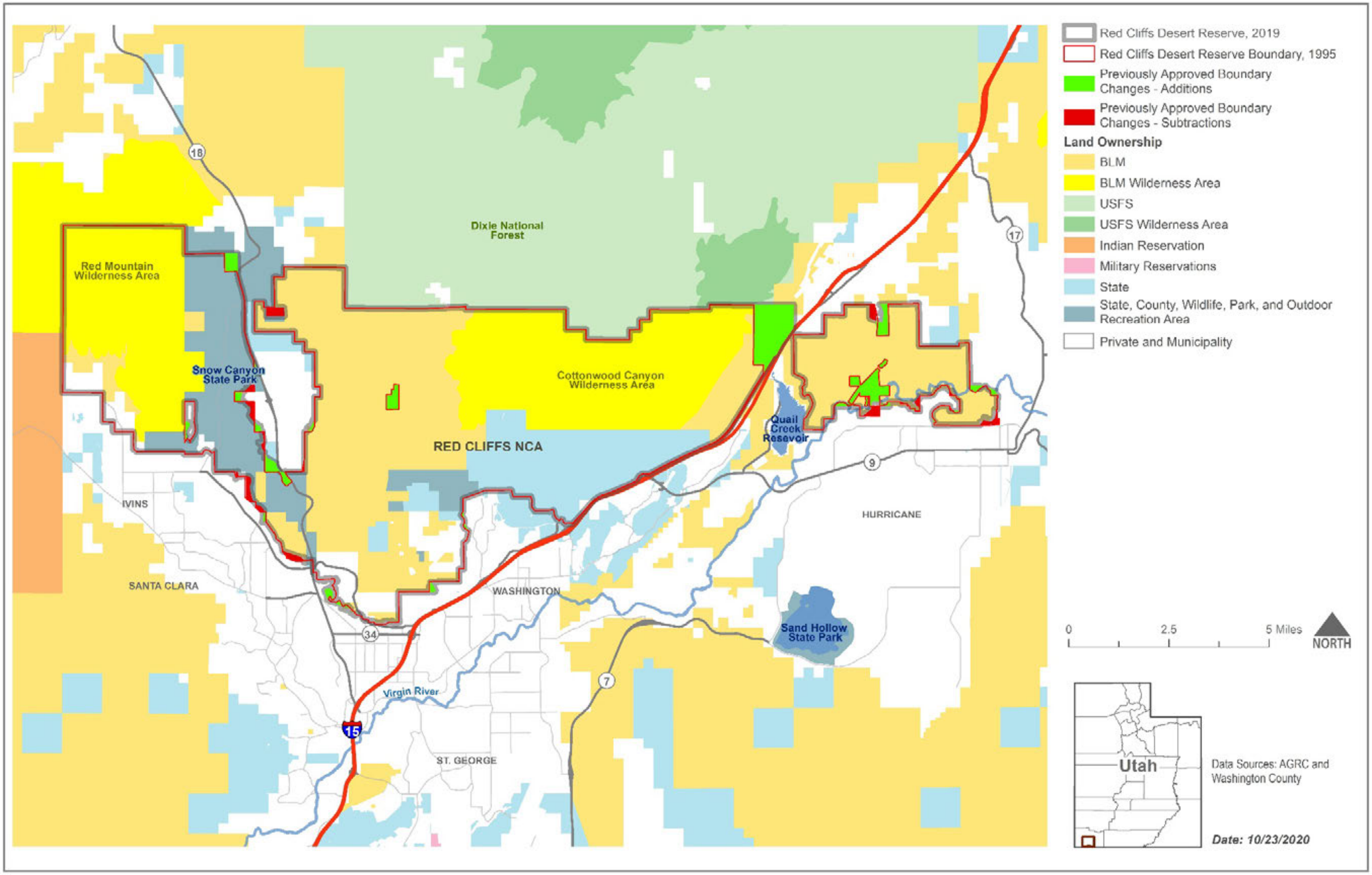
Map 2.3-5. Red Cliffs NCA: Recreation Management Zones – Red Cliffs NCA RMP Amendment Alternatives B and C



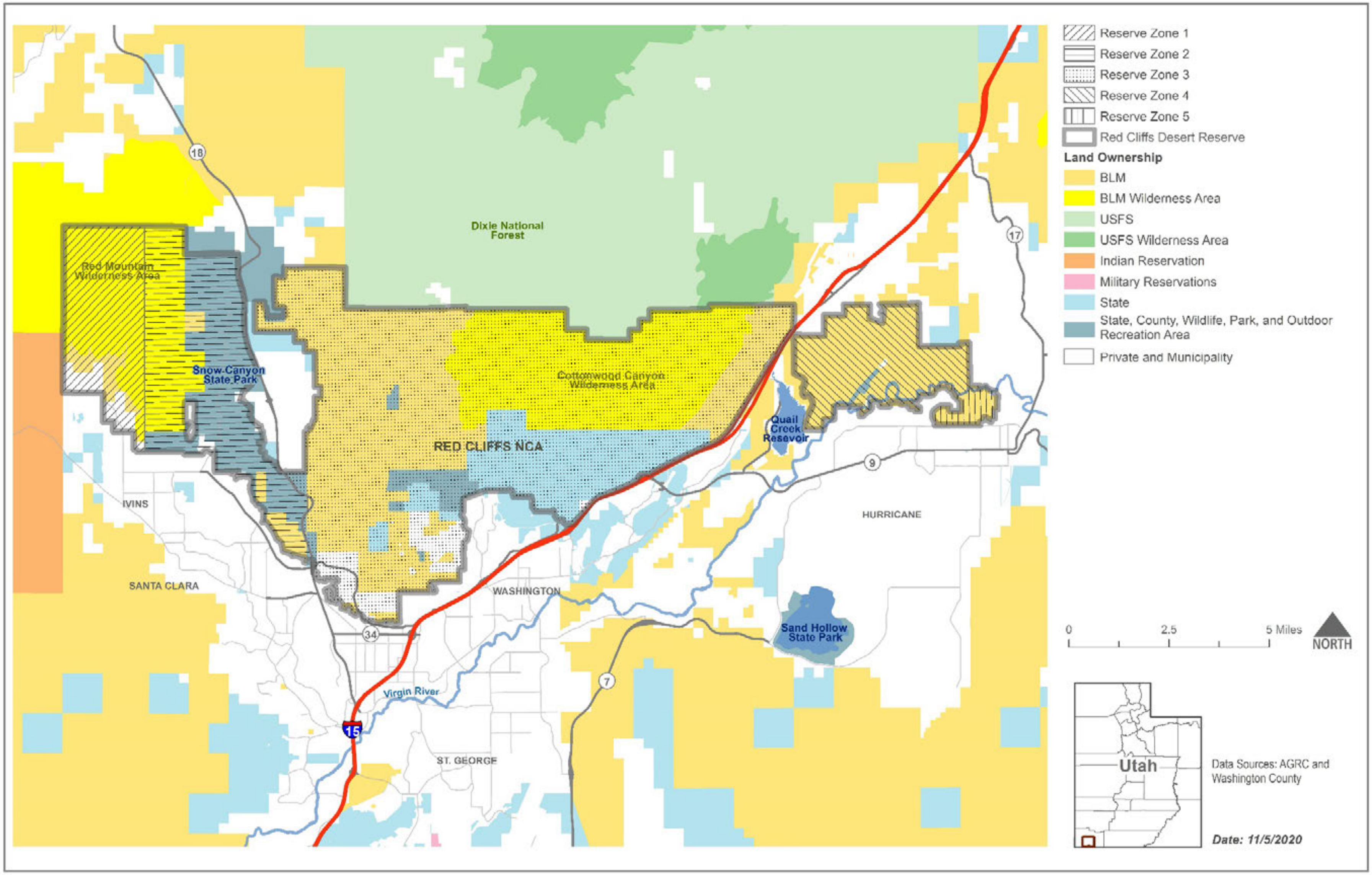
Map 2.4-1. Washington County HCP/ITP: Permit Area



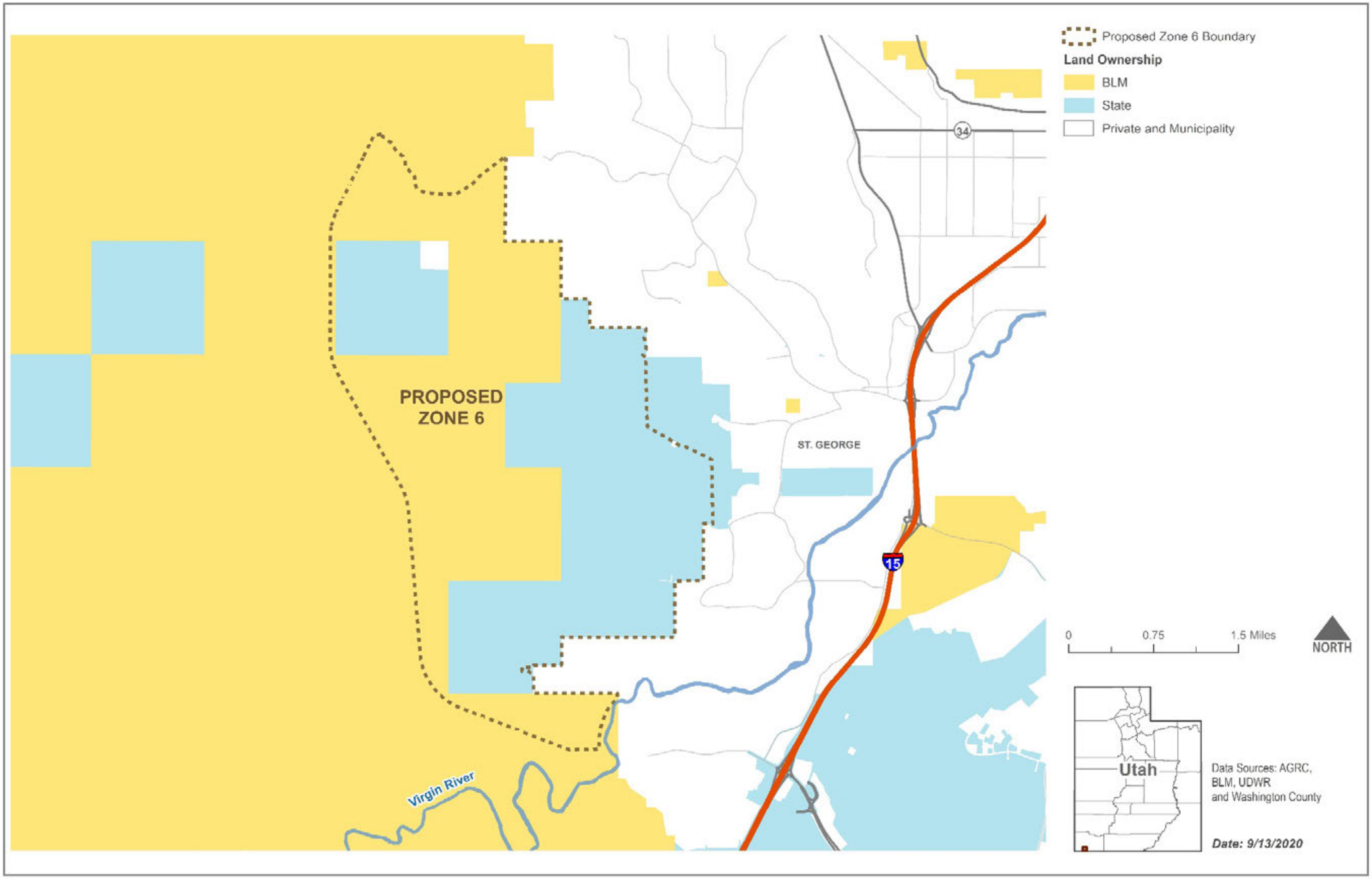
Map 2.4-2. Washington County HCP/ITP: Red Cliffs Desert Reserve Boundary Changes



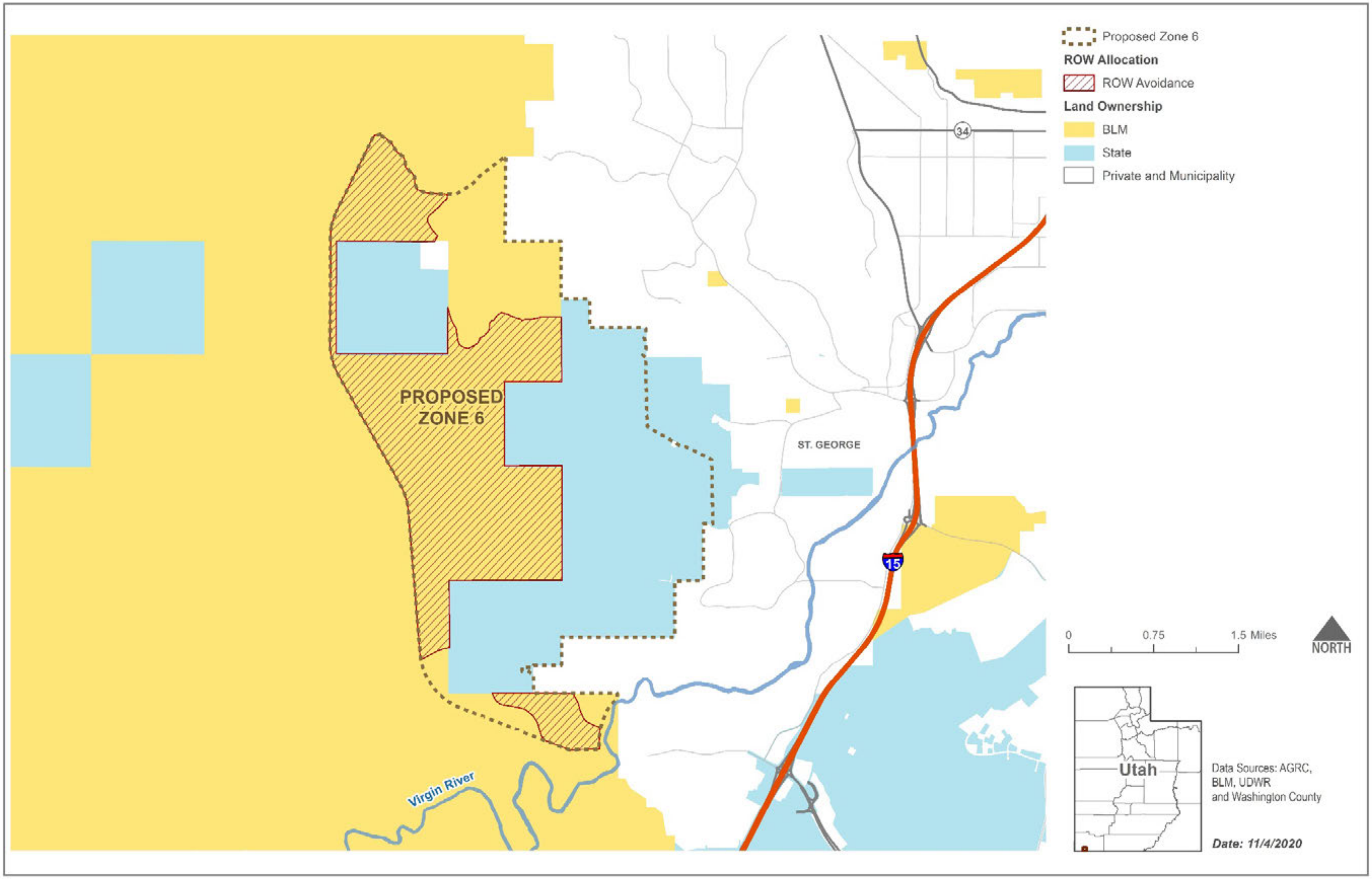
Map 2.4-3. Washington County HCP/ITP: Red Cliffs Desert Reserve, Zones 1 to 5



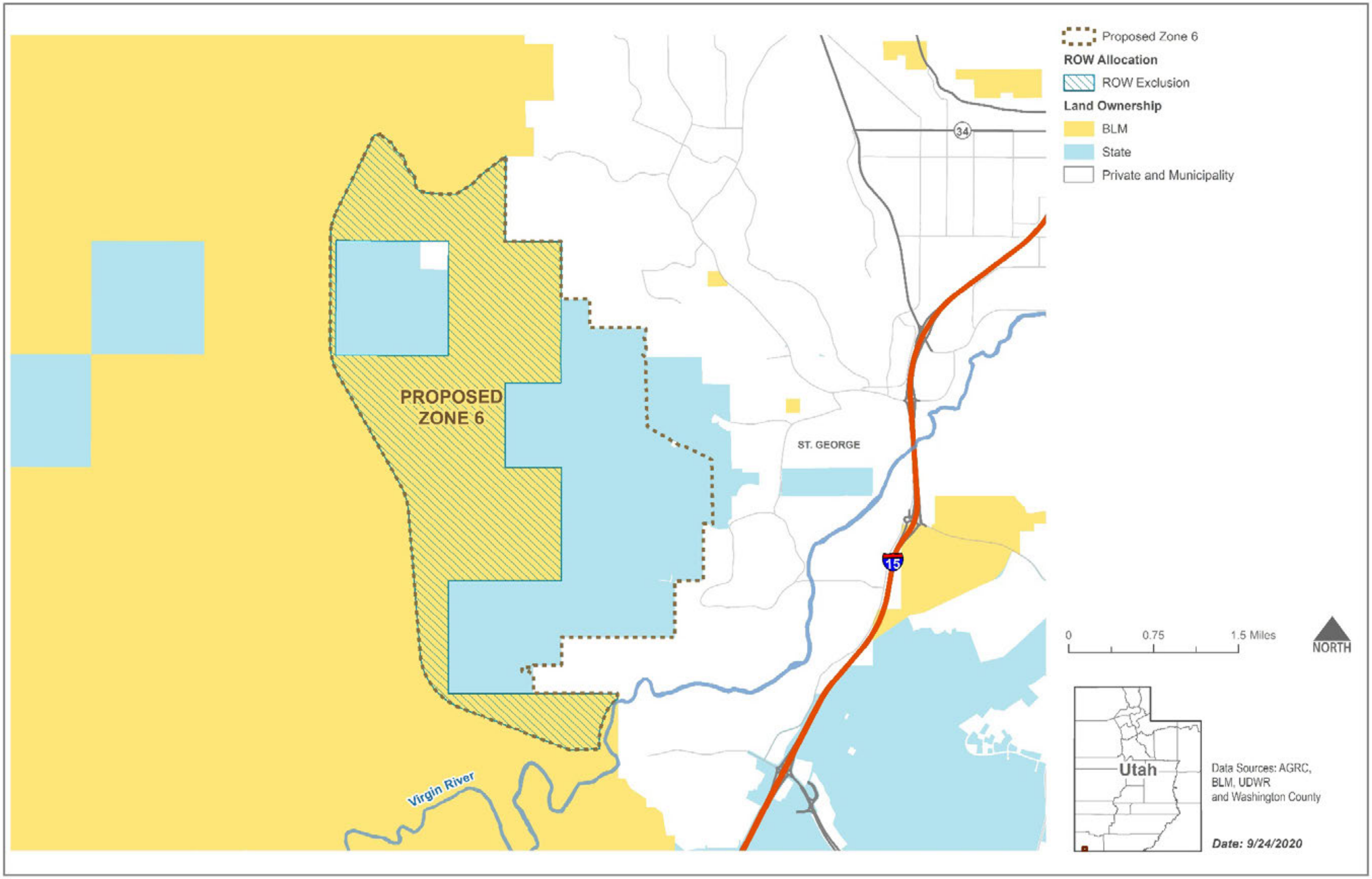
Map 2.4-4. Washington County HCP/ITP: Proposed Zone 6



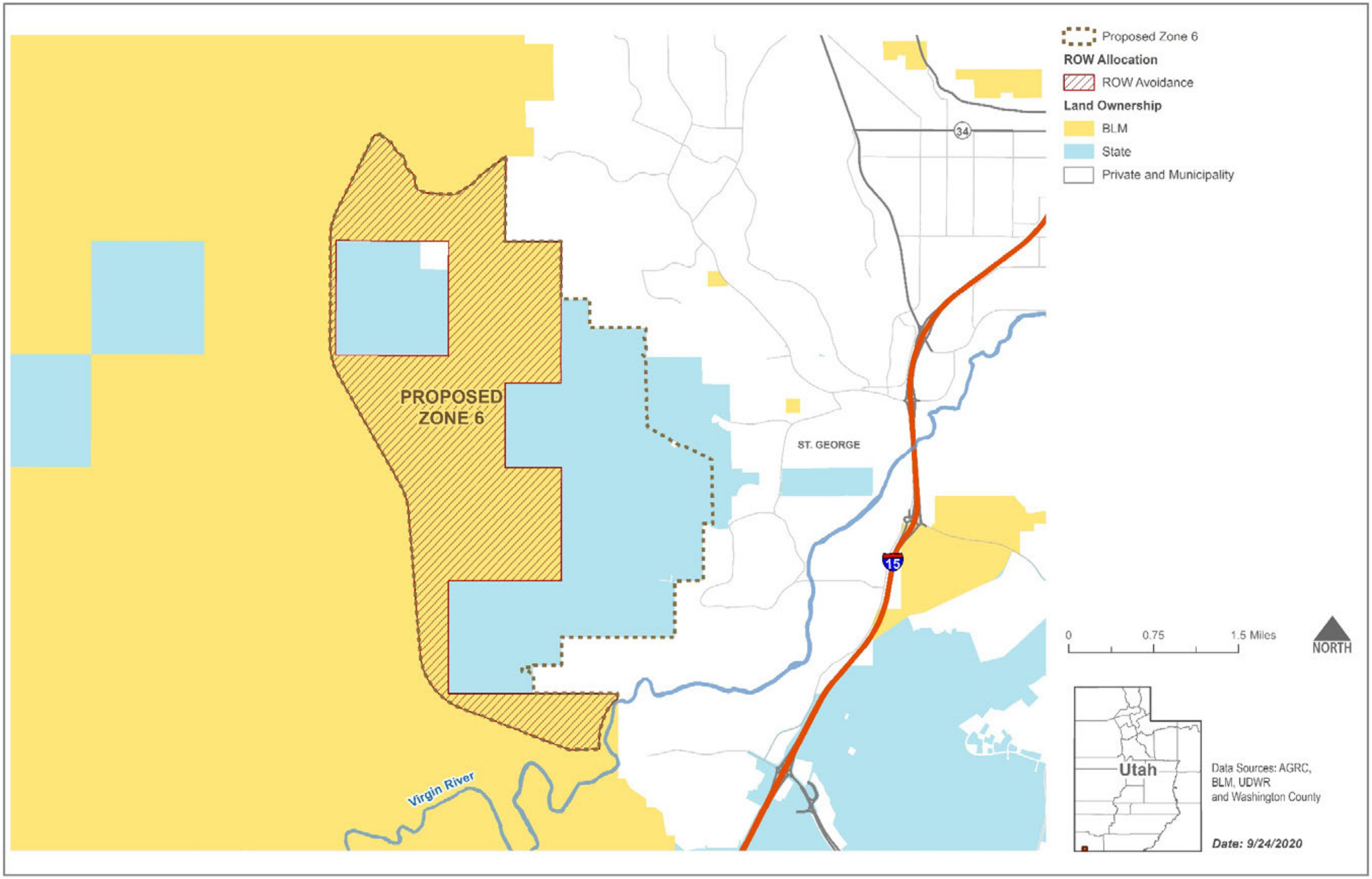
Map 2.5-1. Proposed Zone 6: Right-of-way Avoidance and Exclusion Areas – SGFO RMP Amendment Alternative A



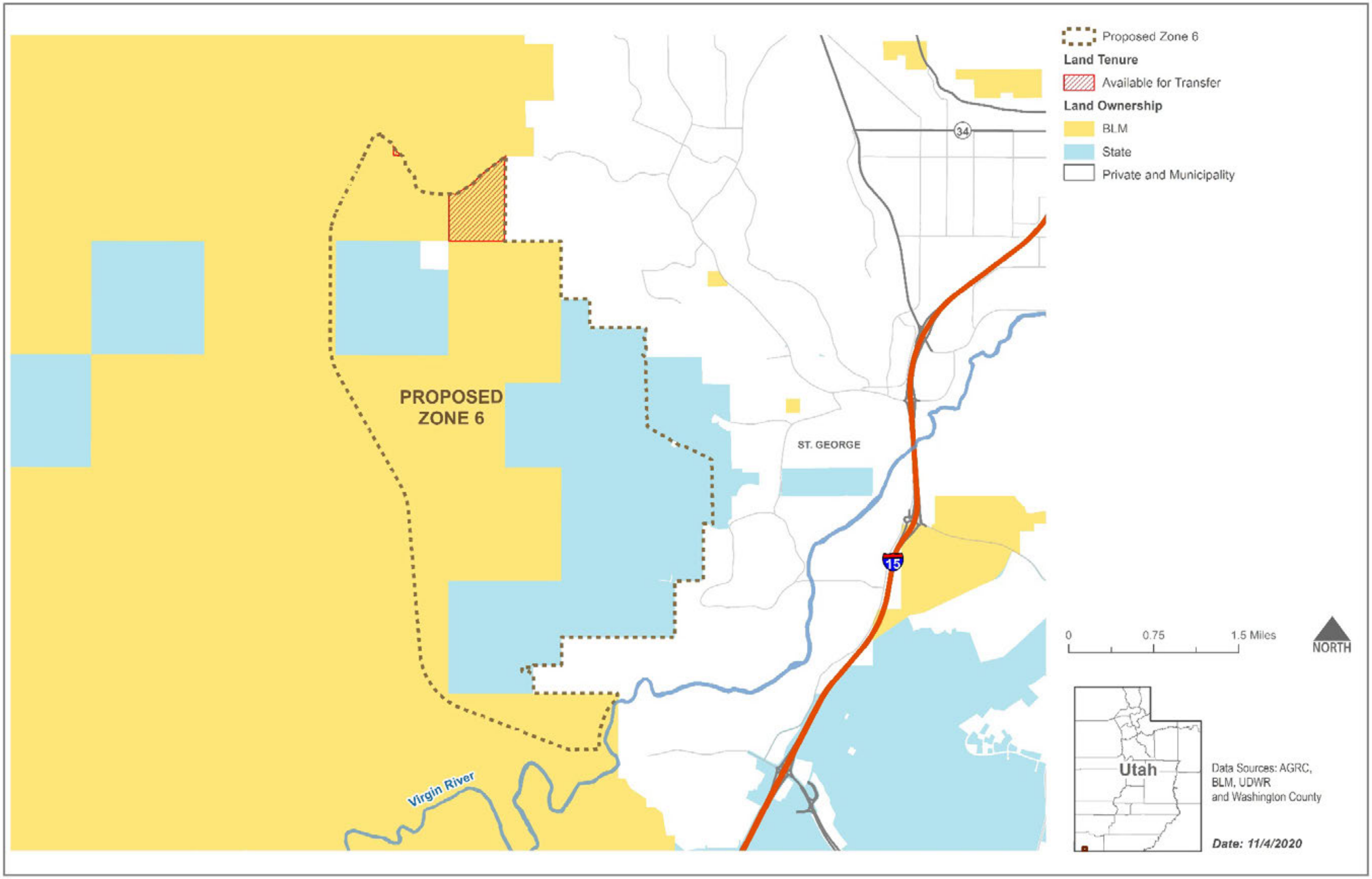
Map 2.5-2. Proposed Zone 6: Right-of-way Avoidance and Exclusion Areas – SGFO RMP Amendment Alternative B



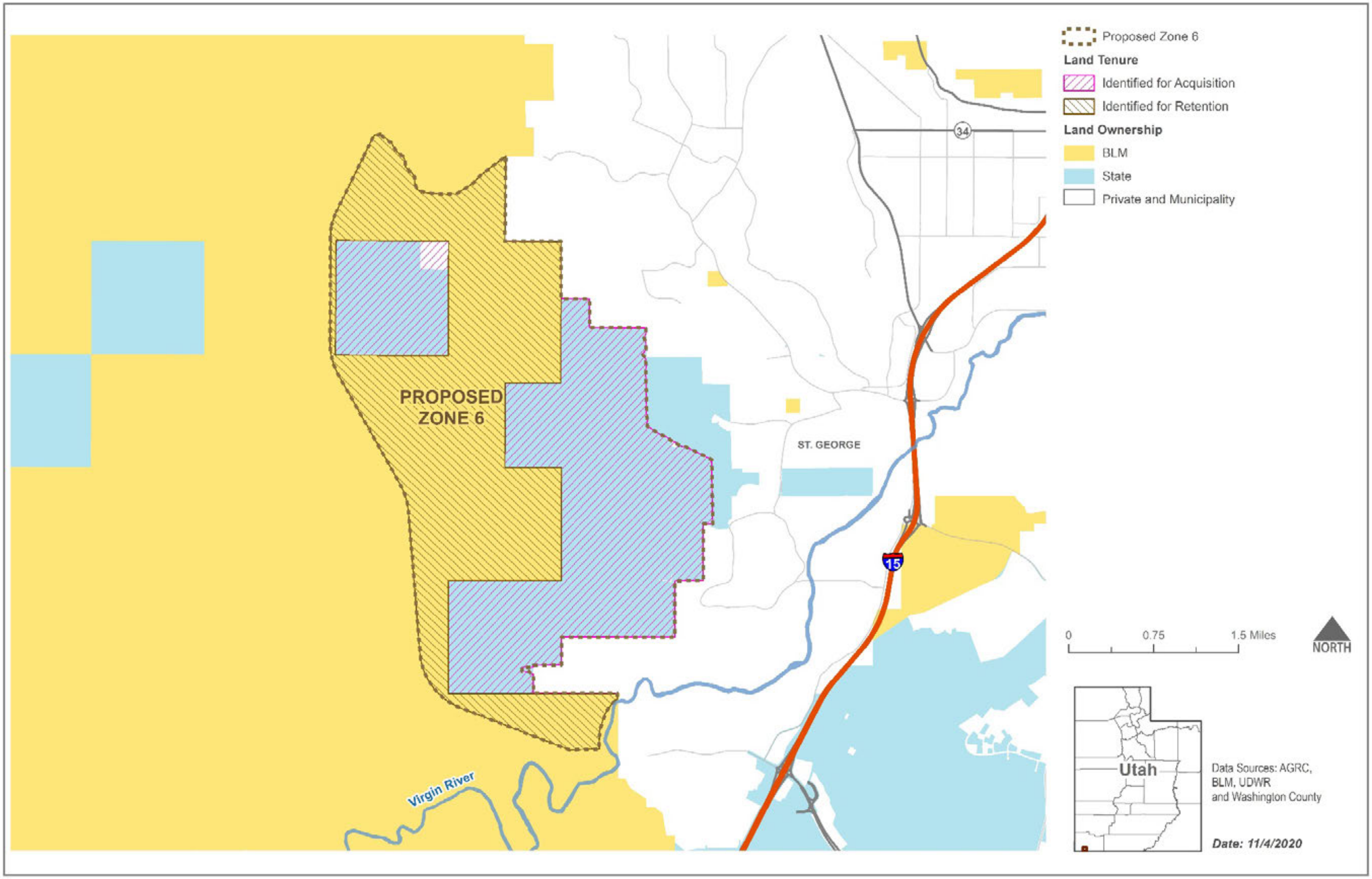
Map 2.5-3. Proposed Zone 6: Right-of-way Avoidance and Exclusion Areas – SGFO RMP Amendment Alternative C



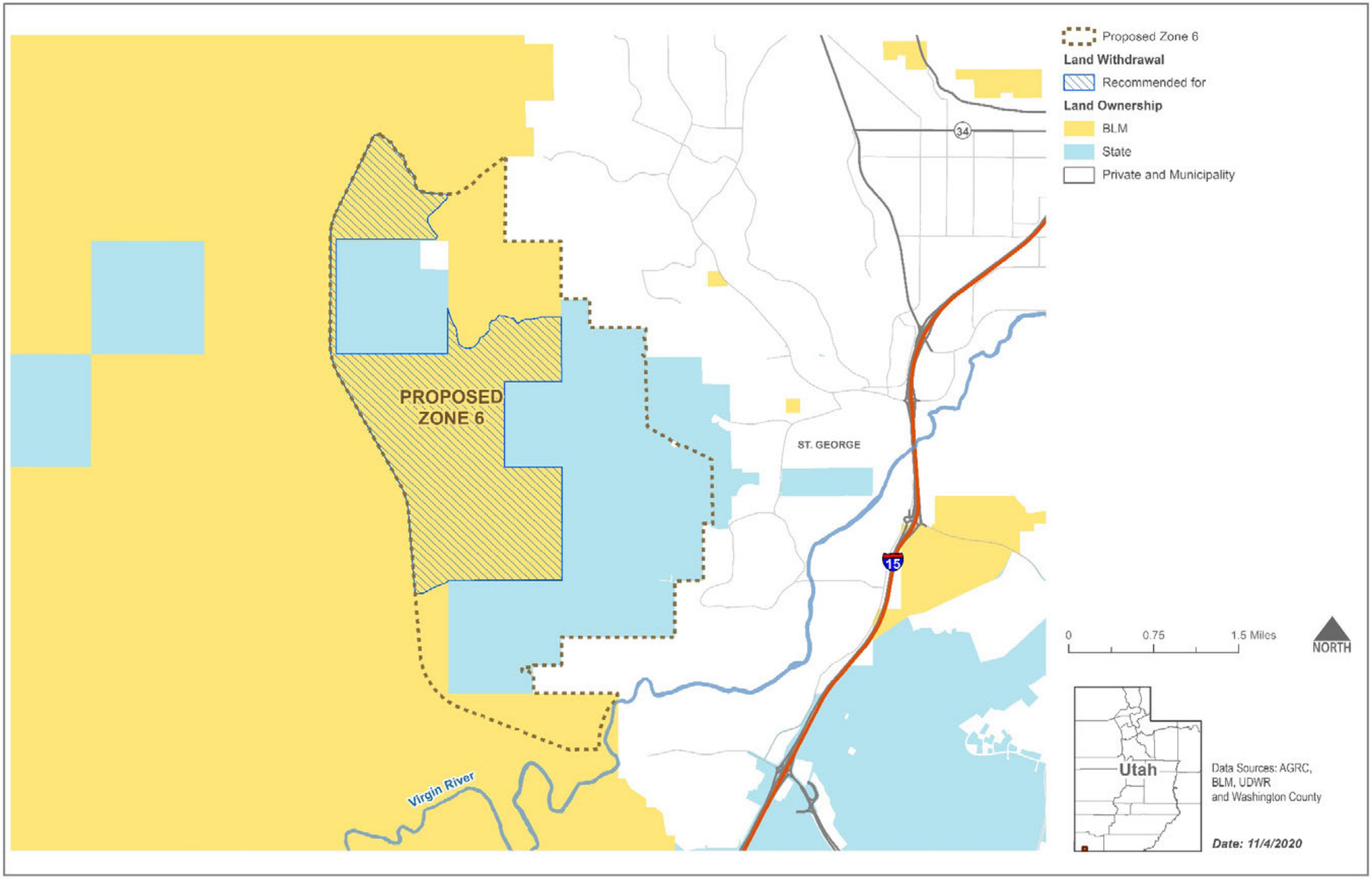
Map 2.5-4. Proposed Zone 6: Land Tenure – SGFO RMP Amendment Alternative A



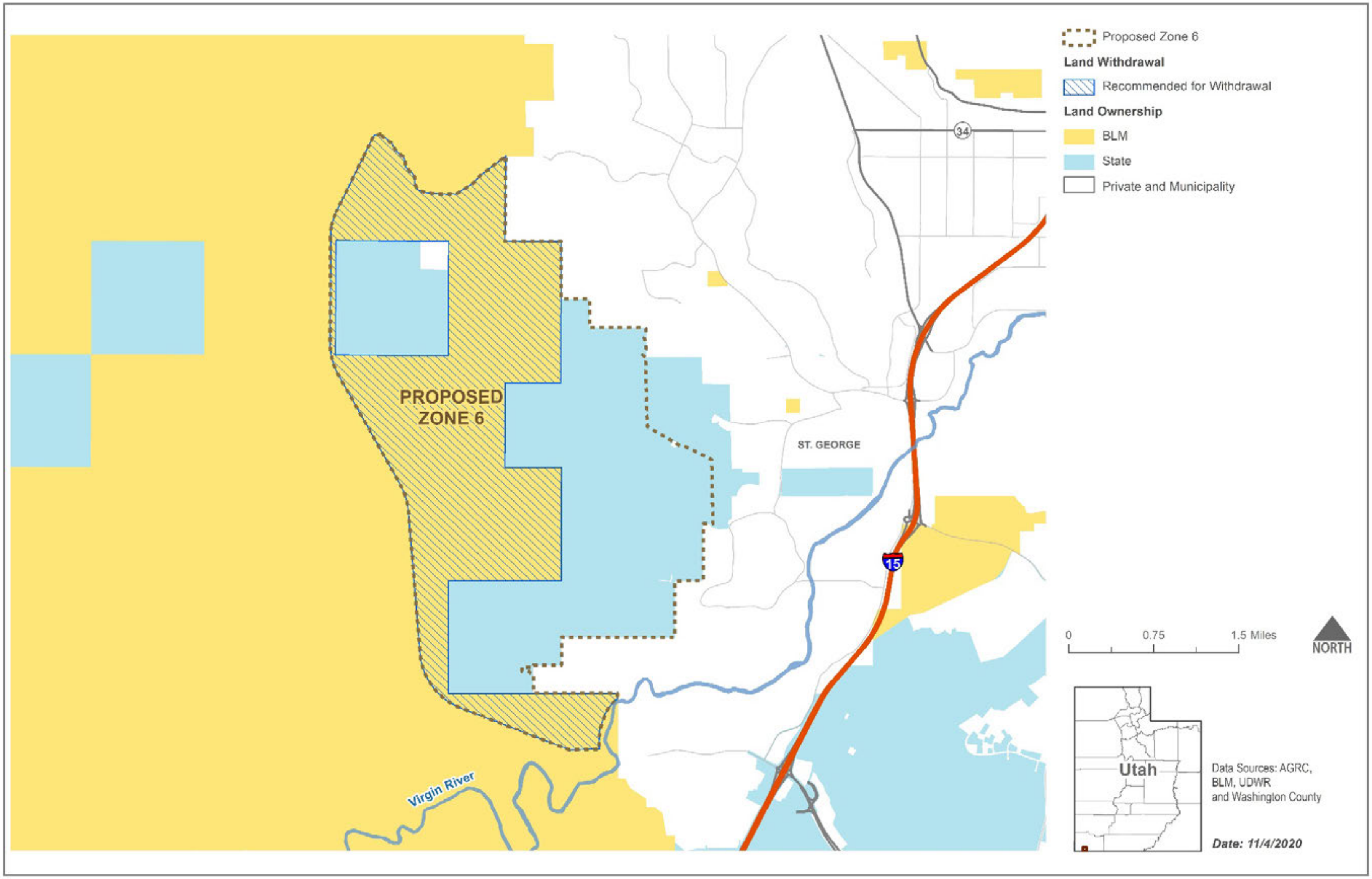
Map 2.5-5. Proposed Zone 6: Land Tenure – SGFO RMP Amendment Alternatives B and C



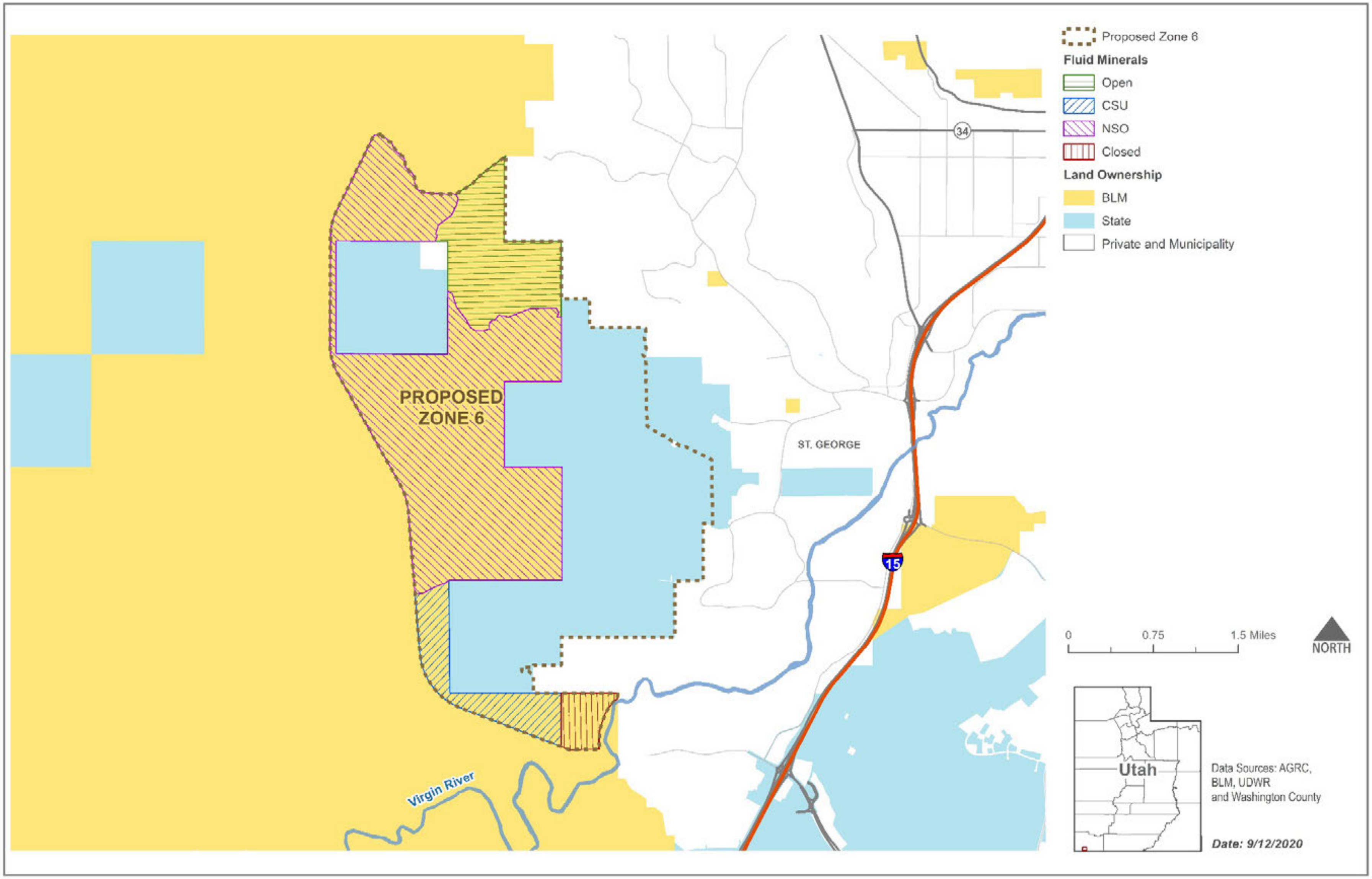
Map 2.5-6. Proposed Zone 6: Land Withdrawal – SGFO RMP Amendment Alternative A



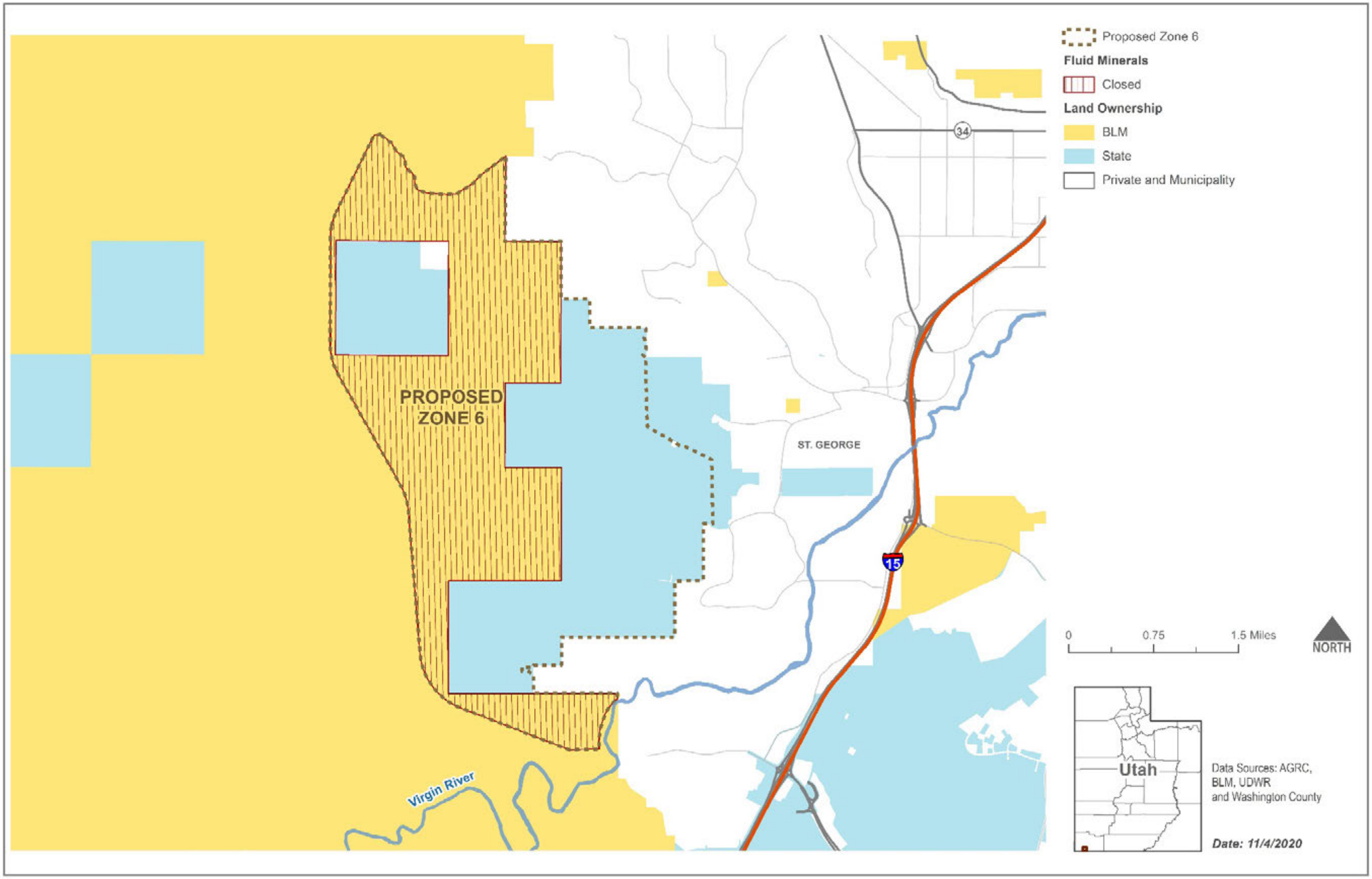
Map 2.5-7. Proposed Zone 6: Land Withdrawal – SGFO RMP Amendment Alternatives B and C



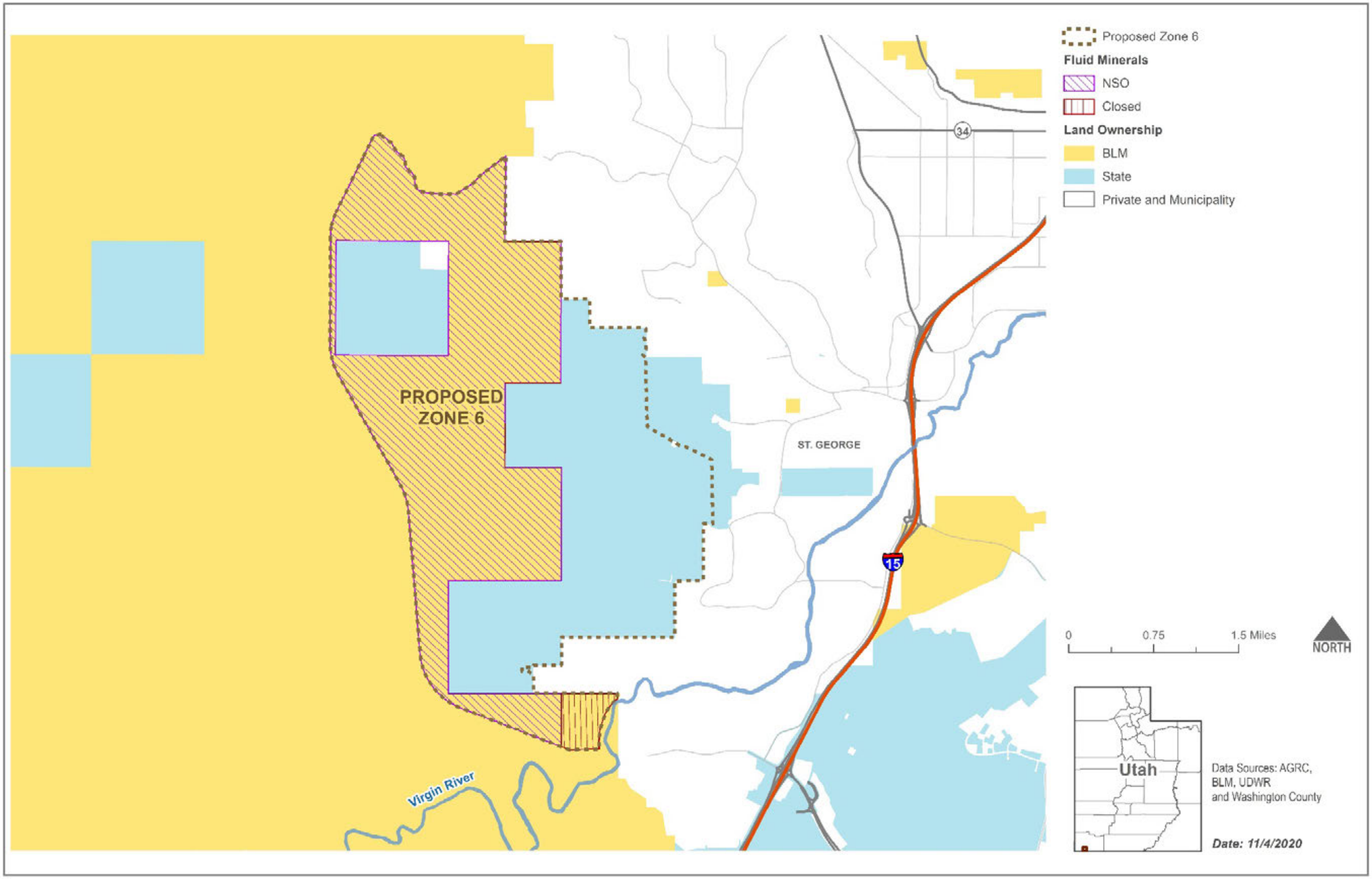
Map 2.5-8. Proposed Zone 6: Fluid Minerals – SGFO RMP Amendment Alternative A



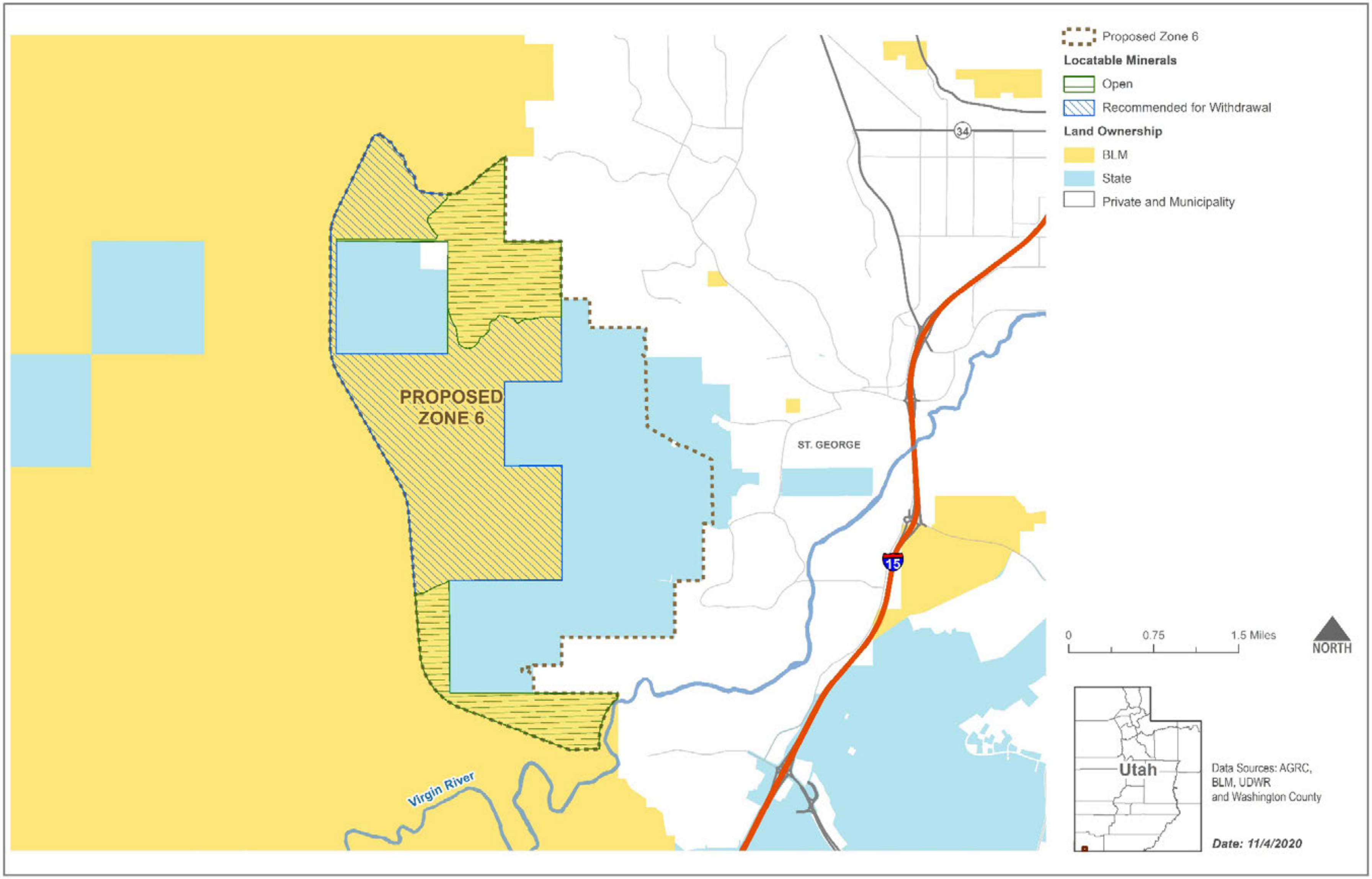
Map 2.5-9. Proposed Zone 6: Fluid Minerals – SGFO RMP Amendment Alternative B



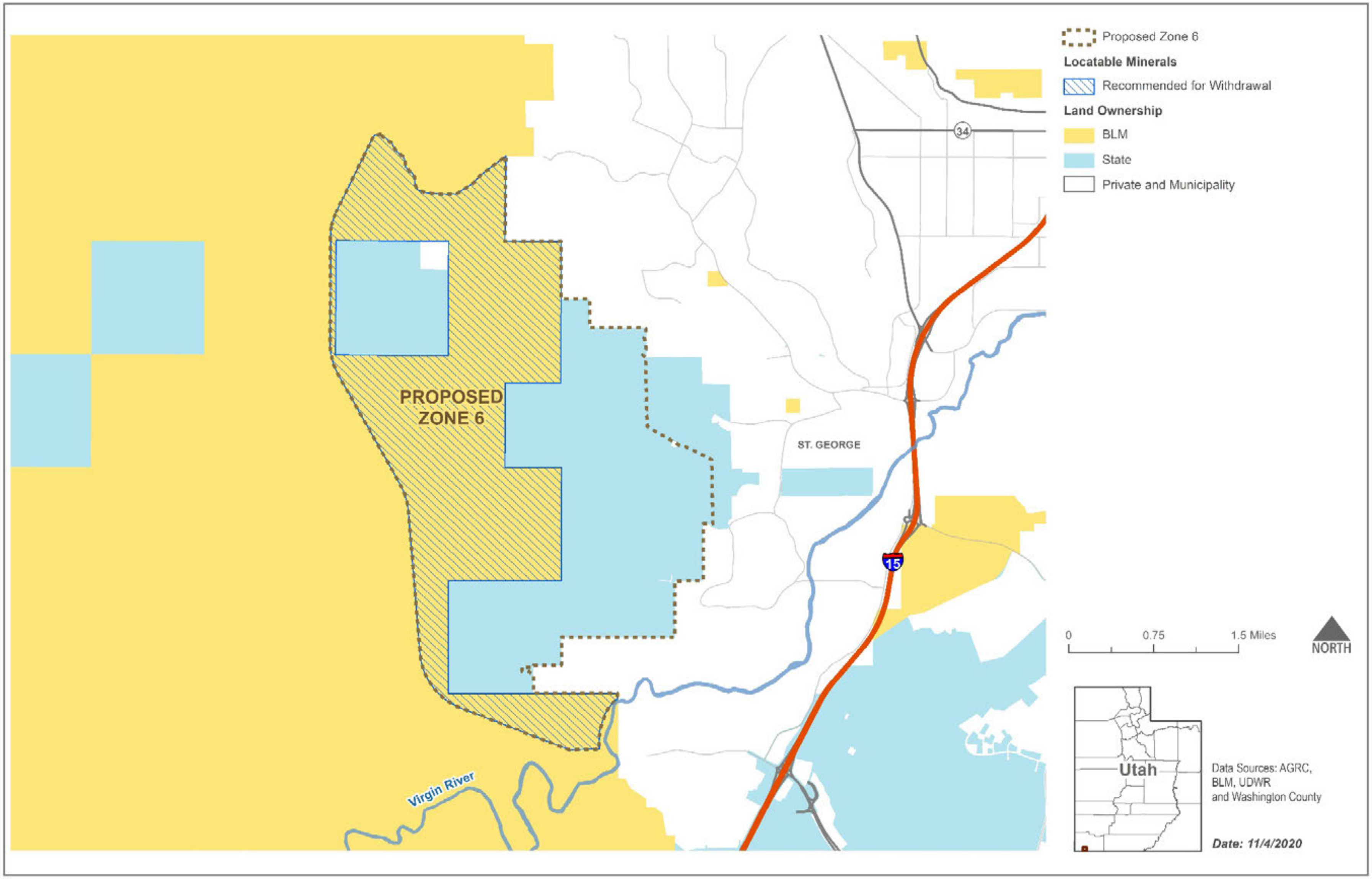
Map 2.5-10. Proposed Zone 6: Fluid Minerals – SGFO RMP Amendment Alternative C



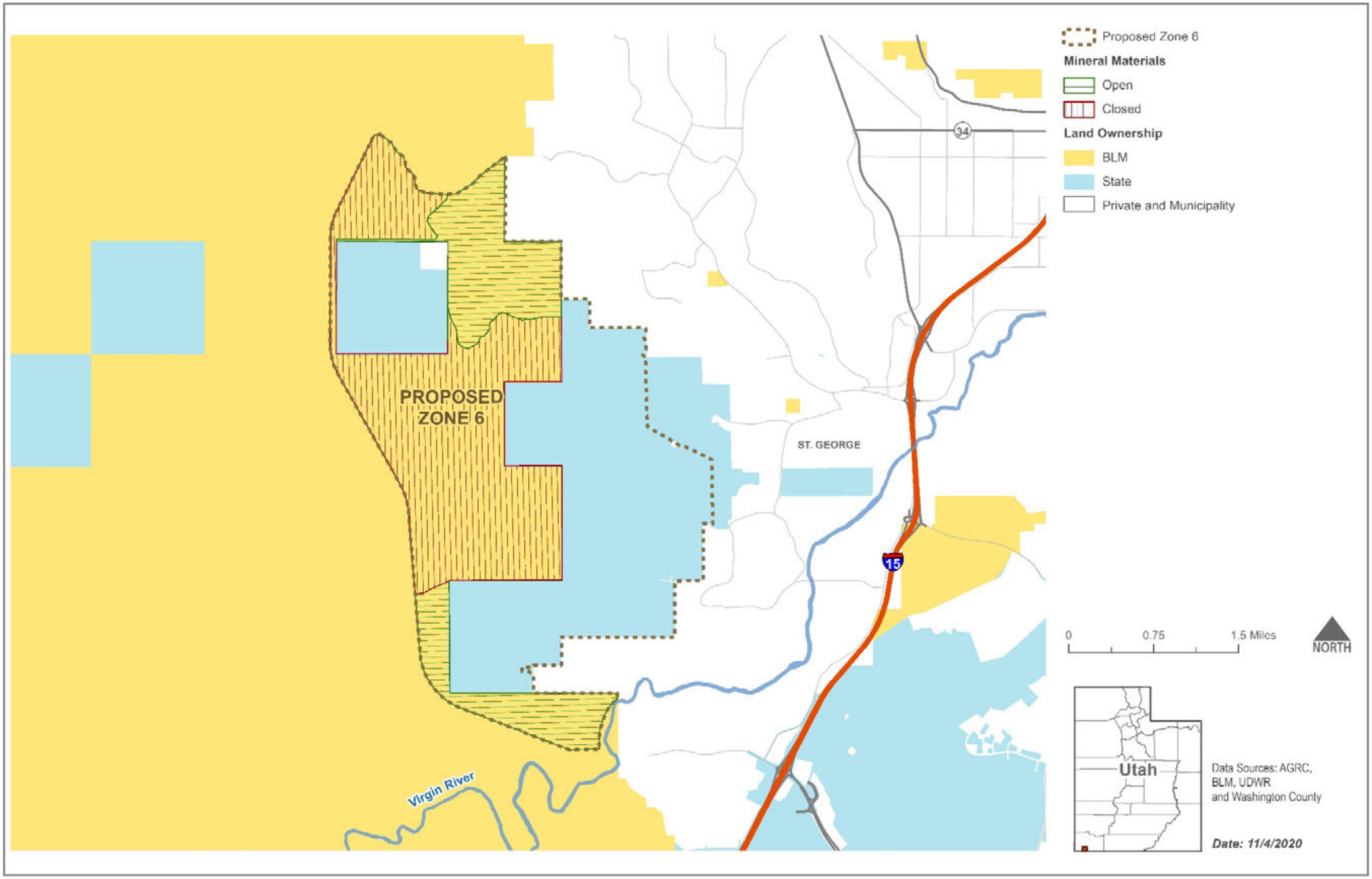
Map 2.5-11. Proposed Zone 6: Locatable Minerals – SGFO RMP Amendment Alternative A



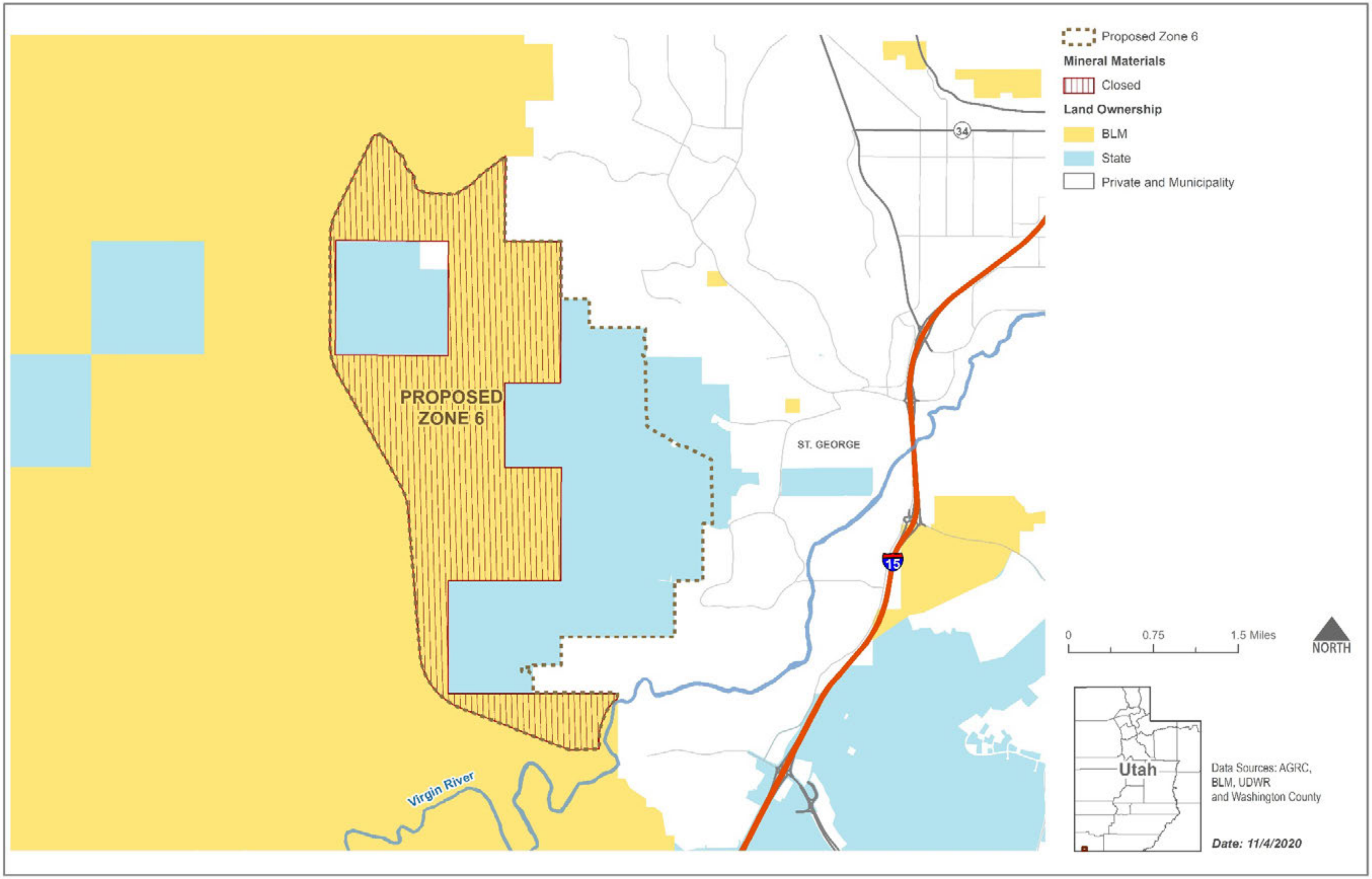
Map 2.5-12. Proposed Zone 6: Locatable Minerals – SGFO RMP Amendment Alternatives B and C



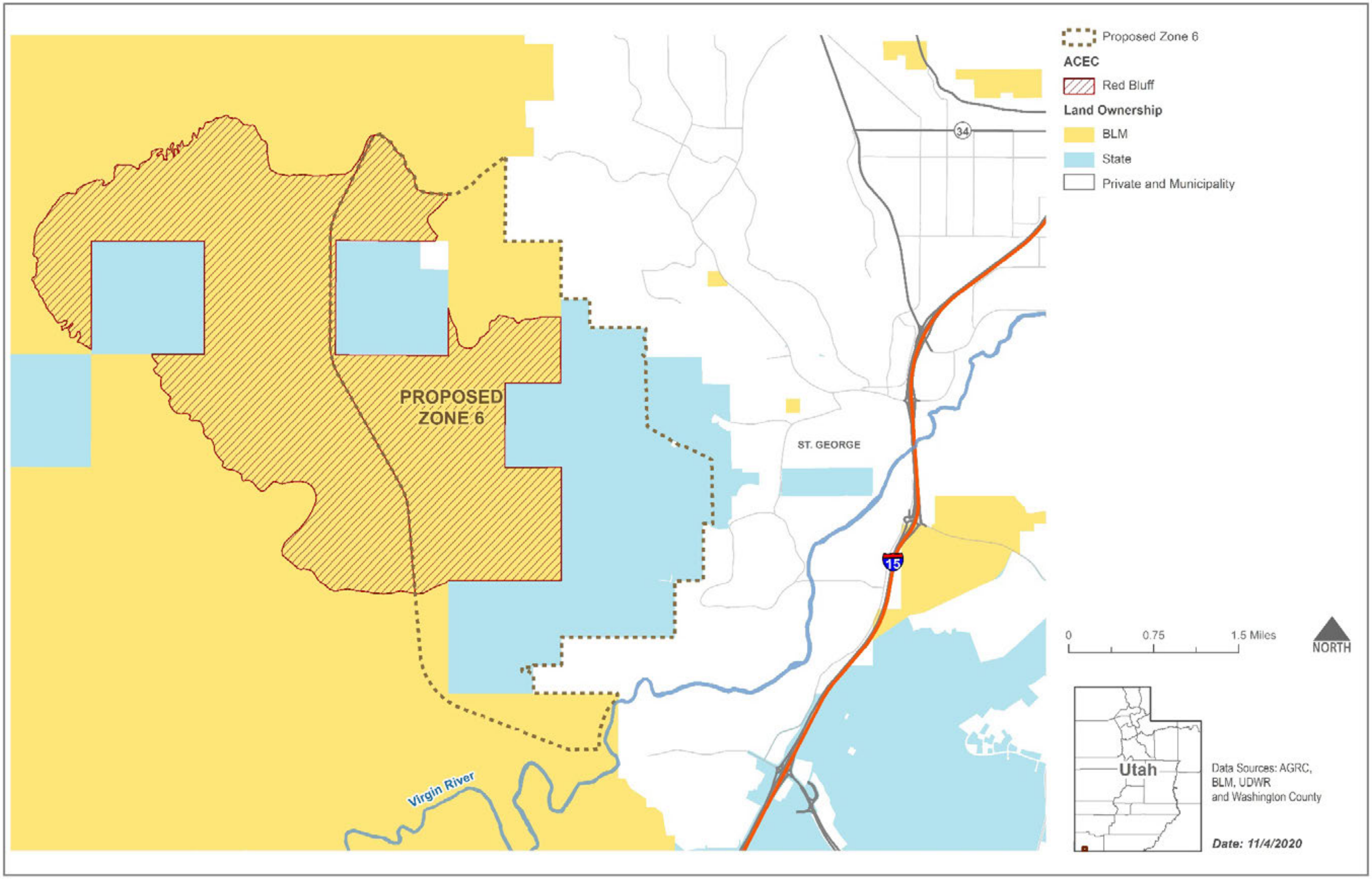
Map 2.5-13. Proposed Zone 6: Mineral Materials – SGFO RMP Amendment Alternative A



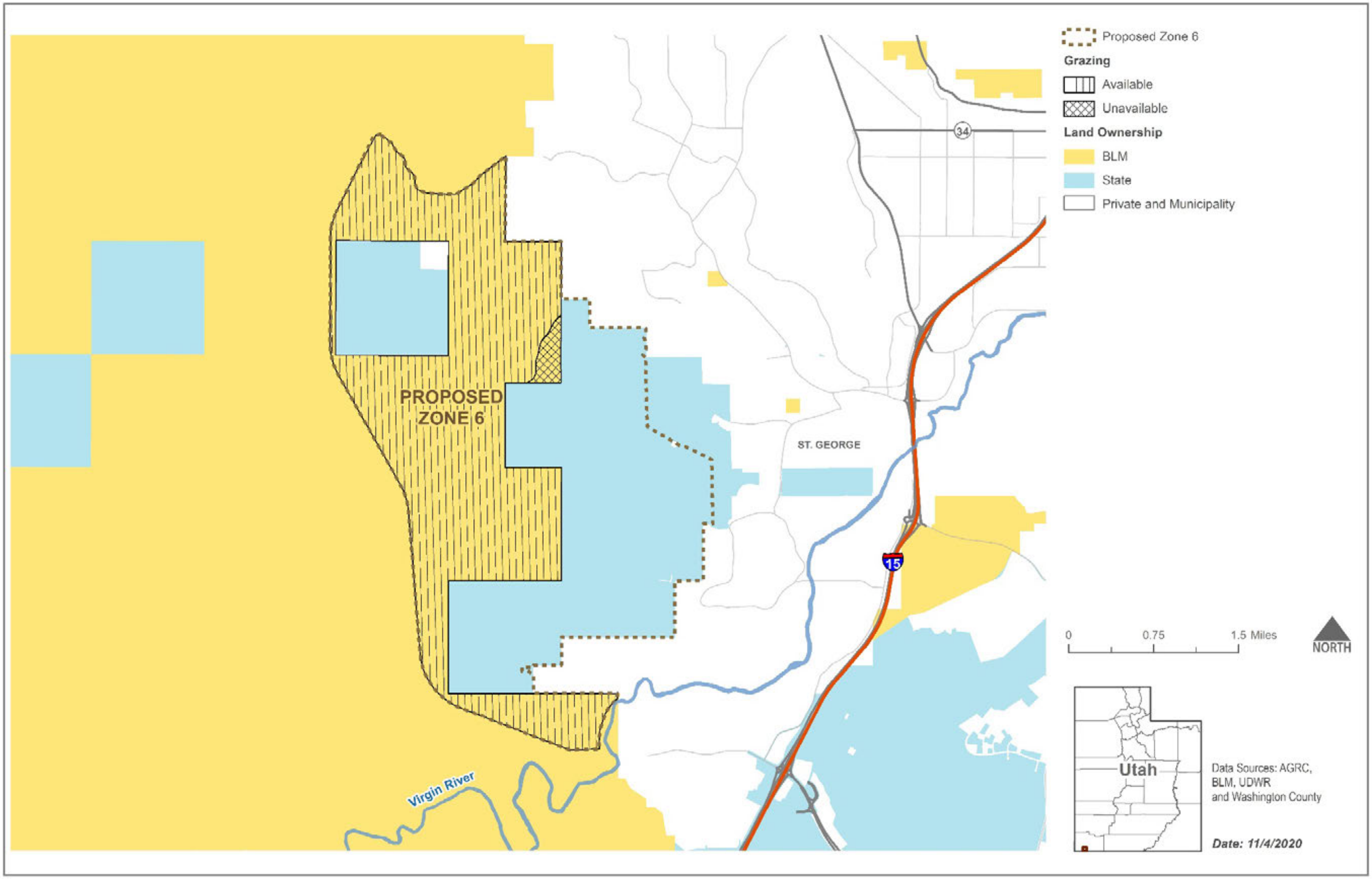
Map 2.5-14. Proposed Zone 6: Mineral Materials – SGFO RMP Amendment Alternatives B and C



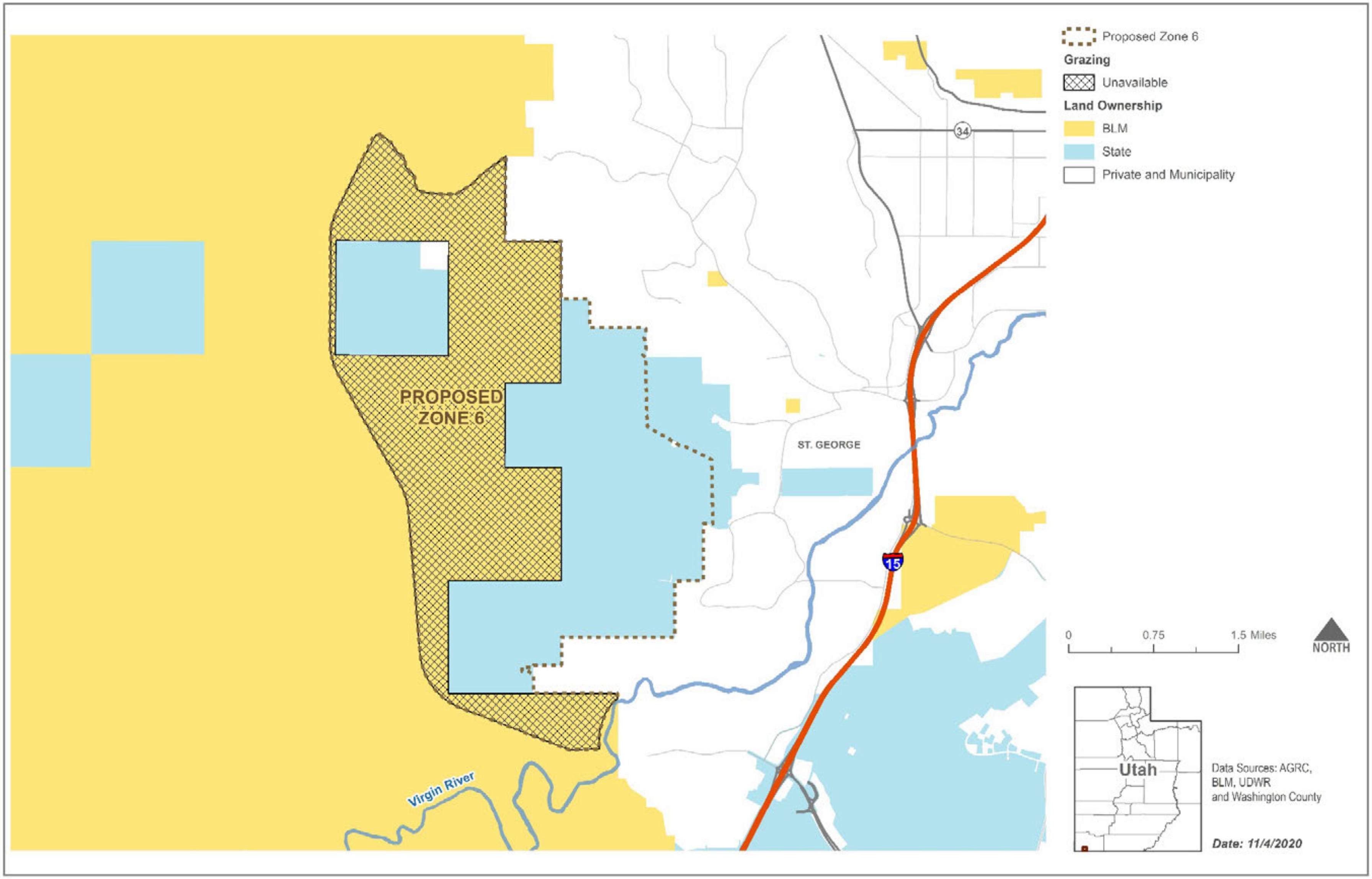
Map 2.5-15. Area of Critical Environmental Concern within Proposed Zone 6



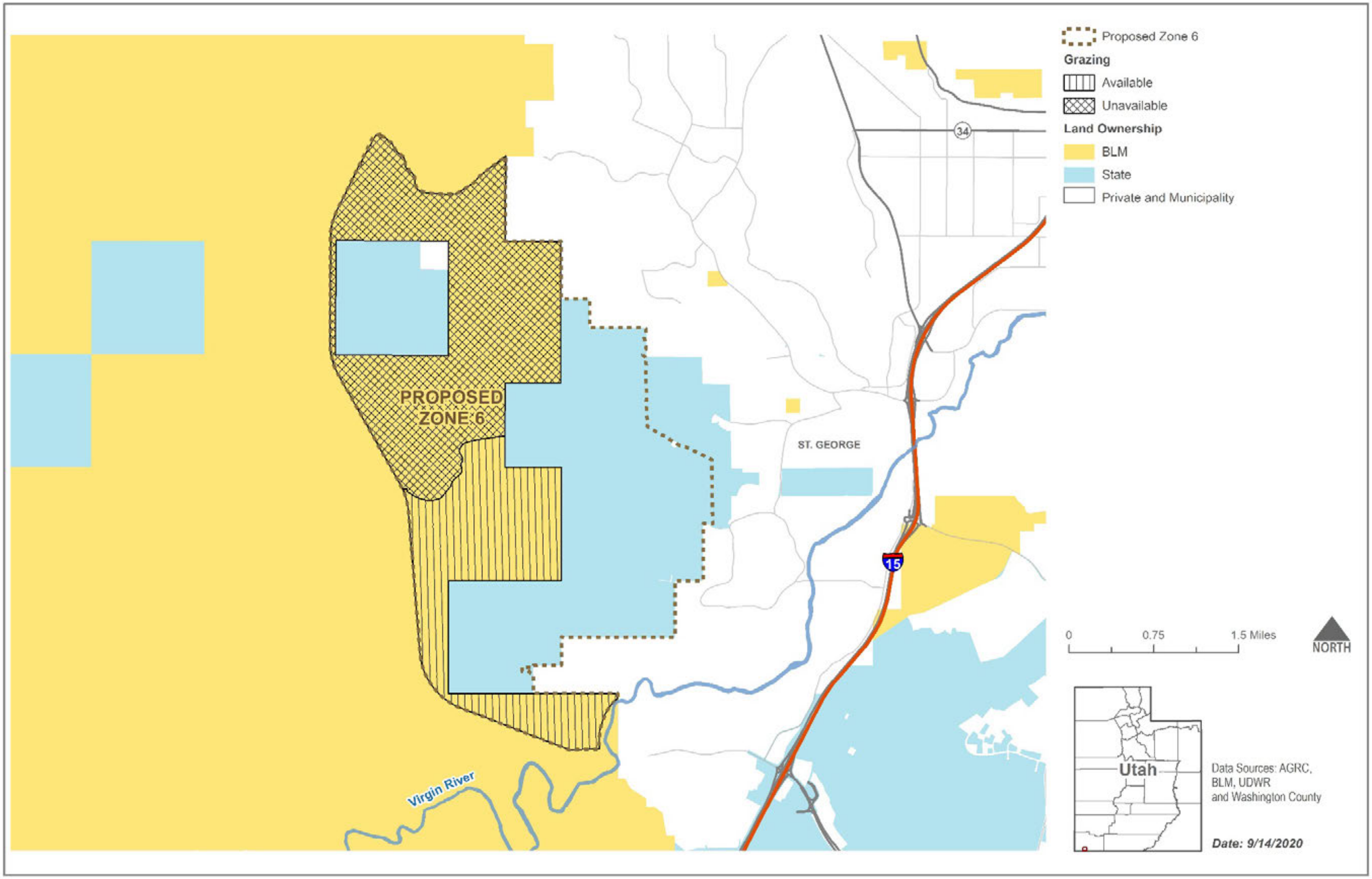
Map 2.5-16. Proposed Zone 6: Livestock Grazing – SGFO RMP Amendment Alternative A



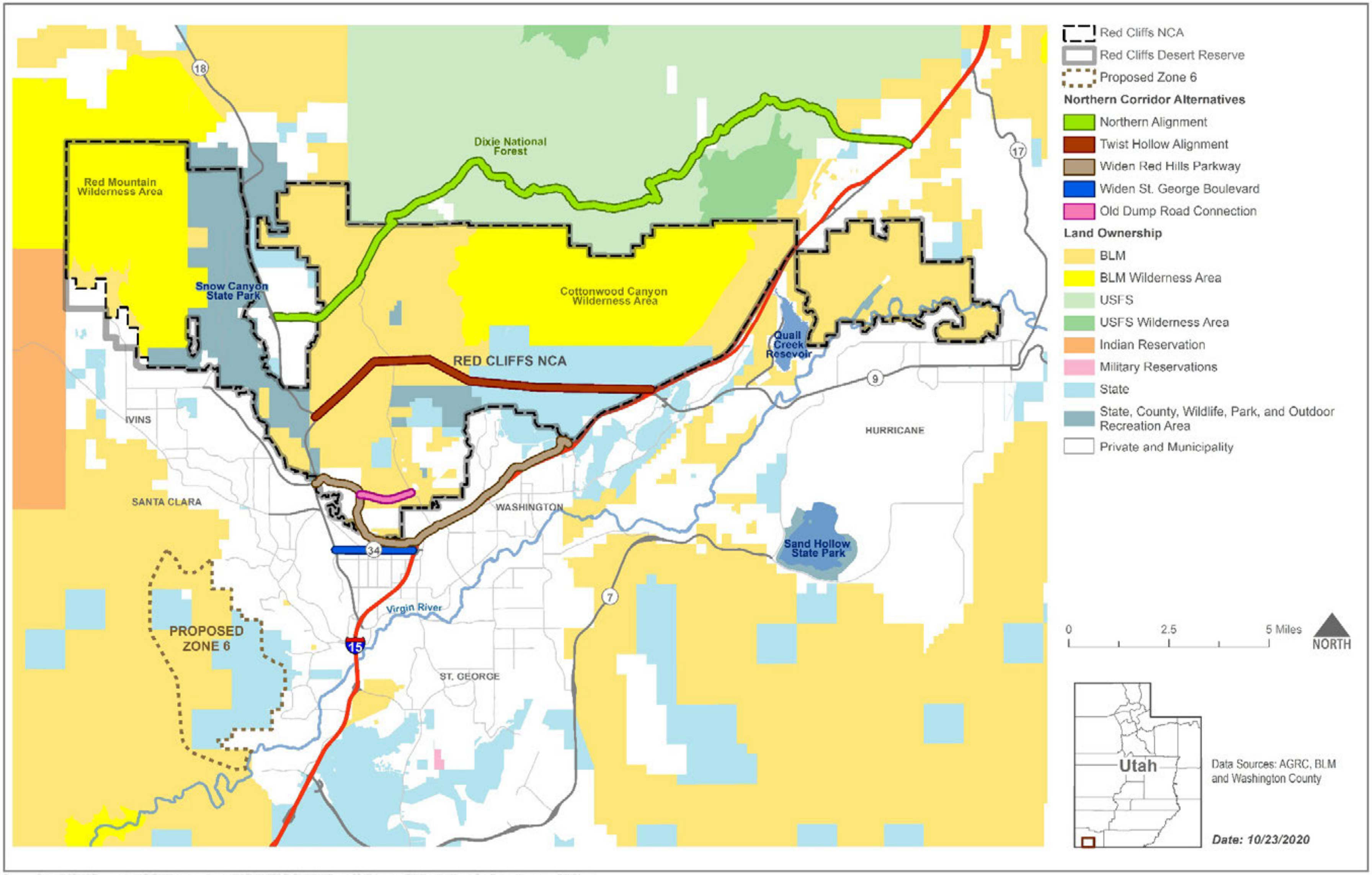
Map 2.5-17. Proposed Zone 6: Livestock Grazing – SGFO RMP Amendment Alternative B



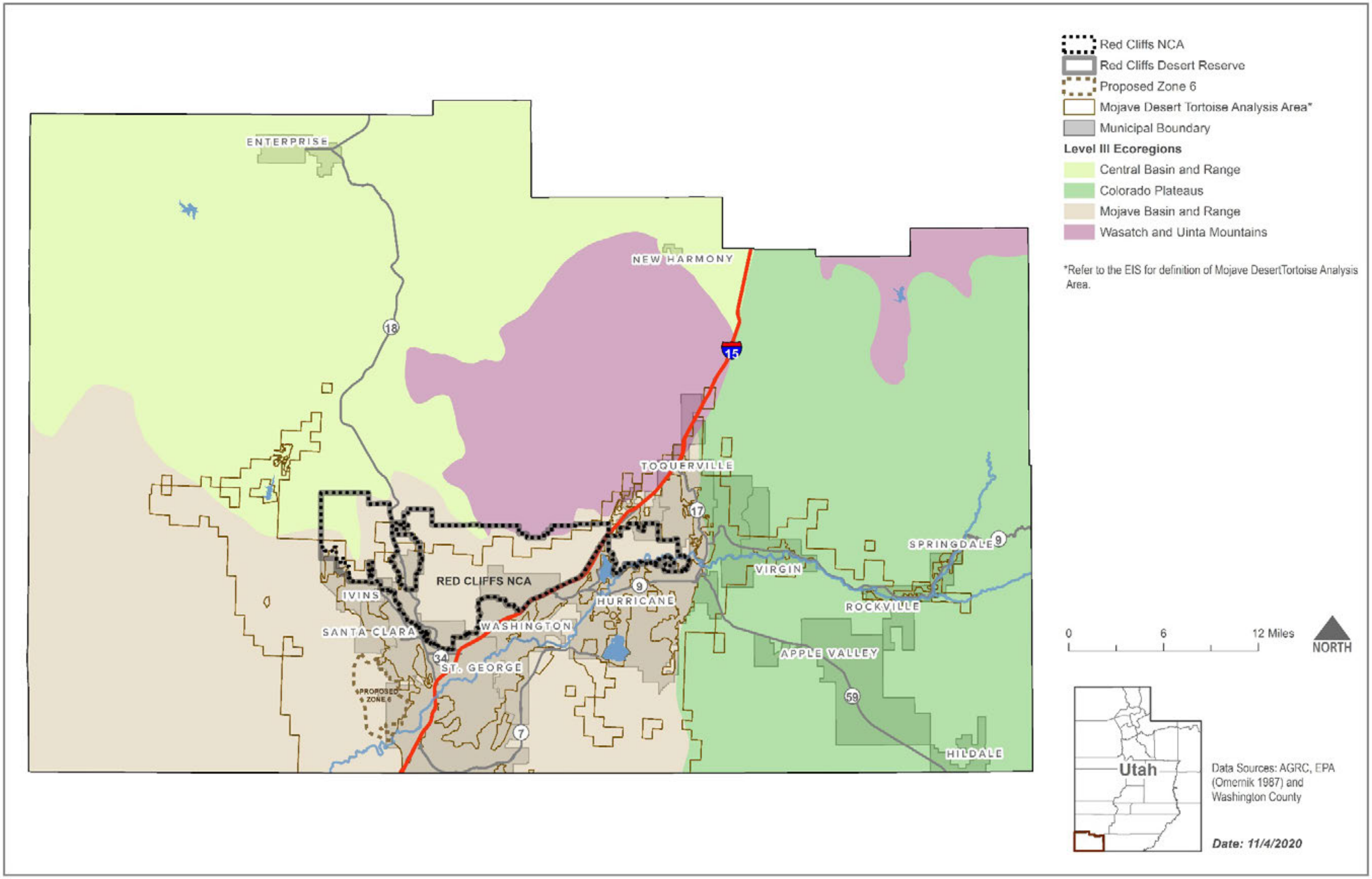
Map 2.5-18. Proposed Zone 6: Livestock Grazing – SGFO RMP Amendment Alternative C



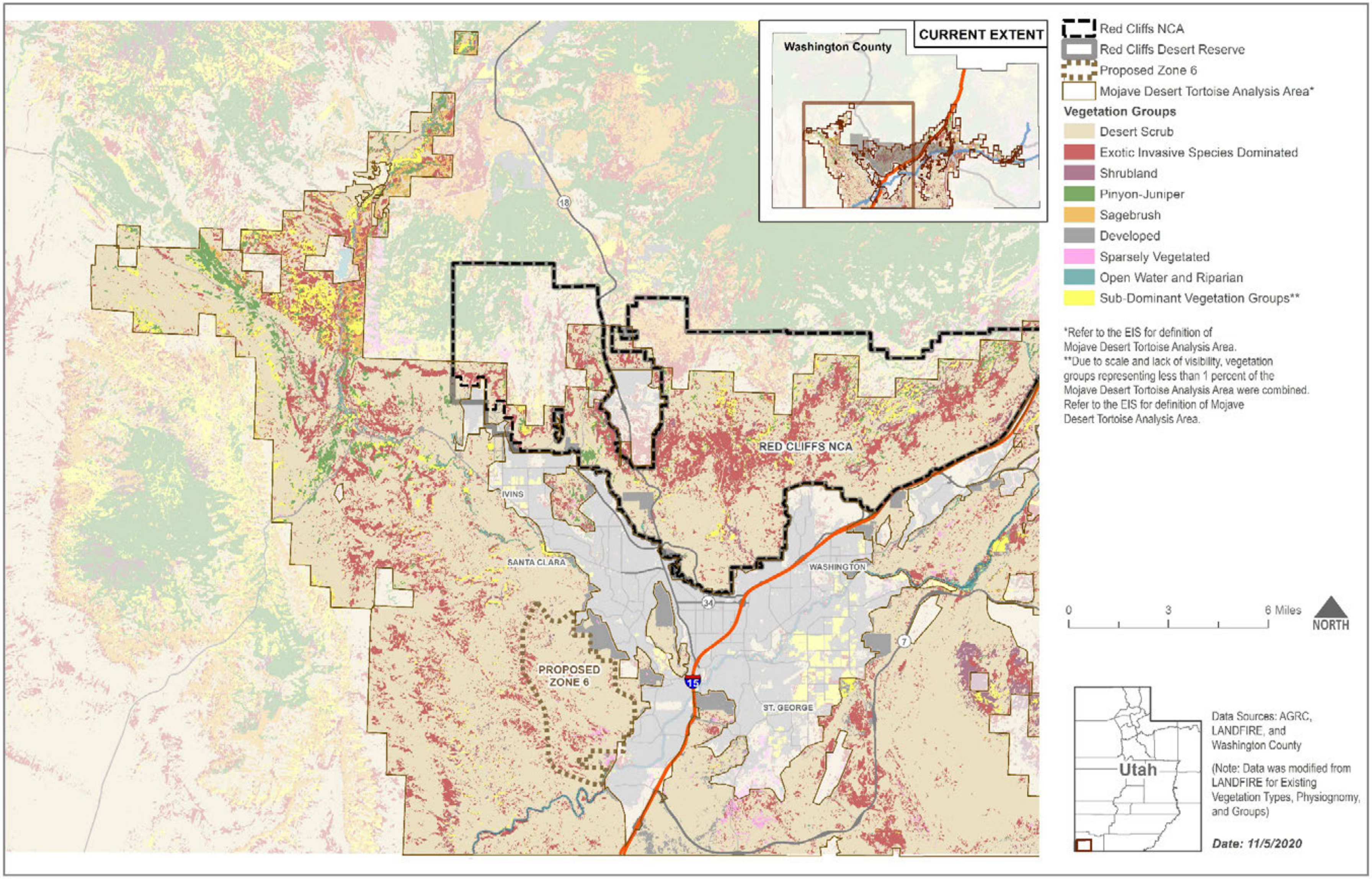
Map 2.7-1. Northern Corridor Alternatives Considered but Eliminated



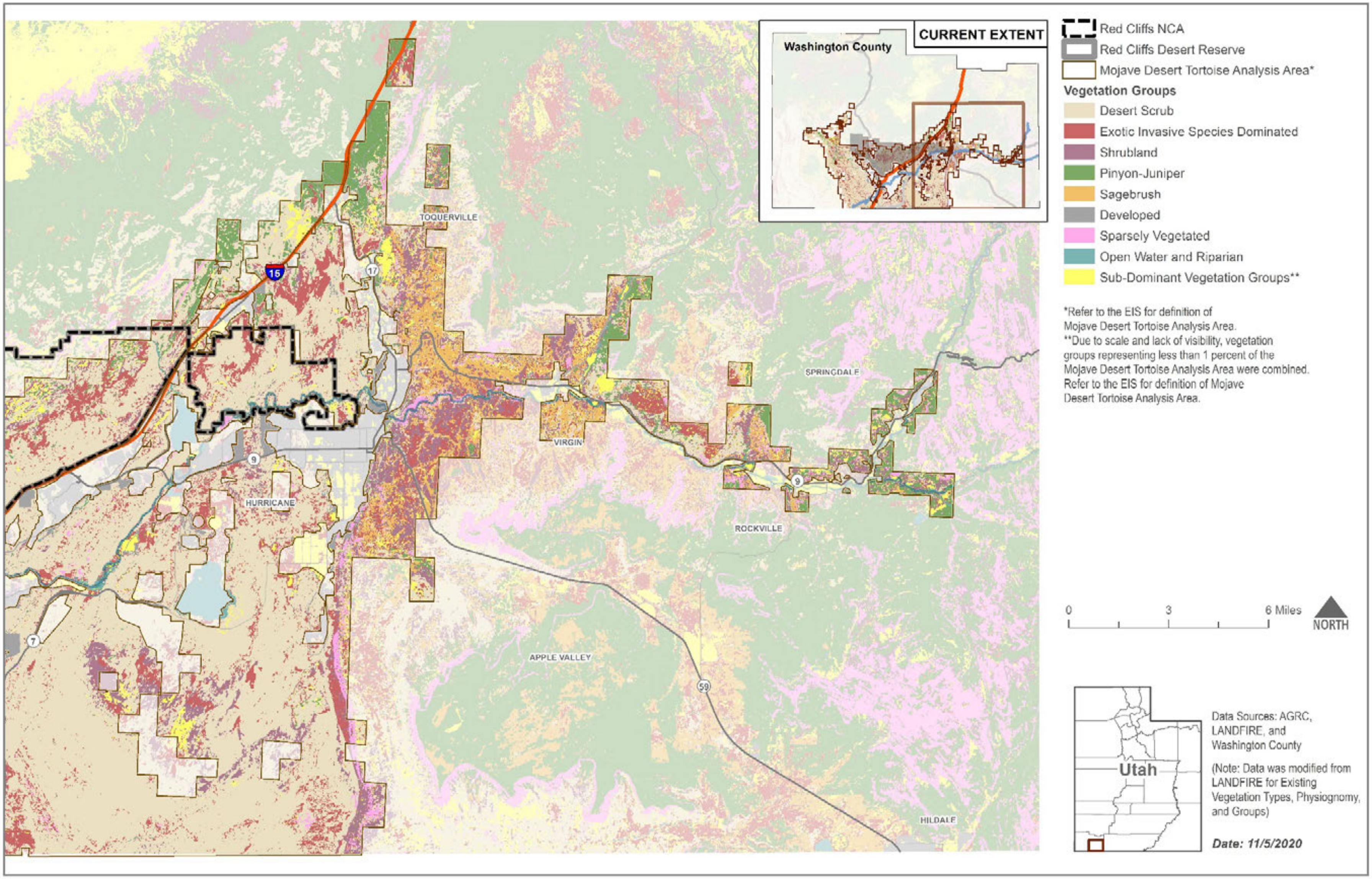
Map 3.2-1. Ecoregions



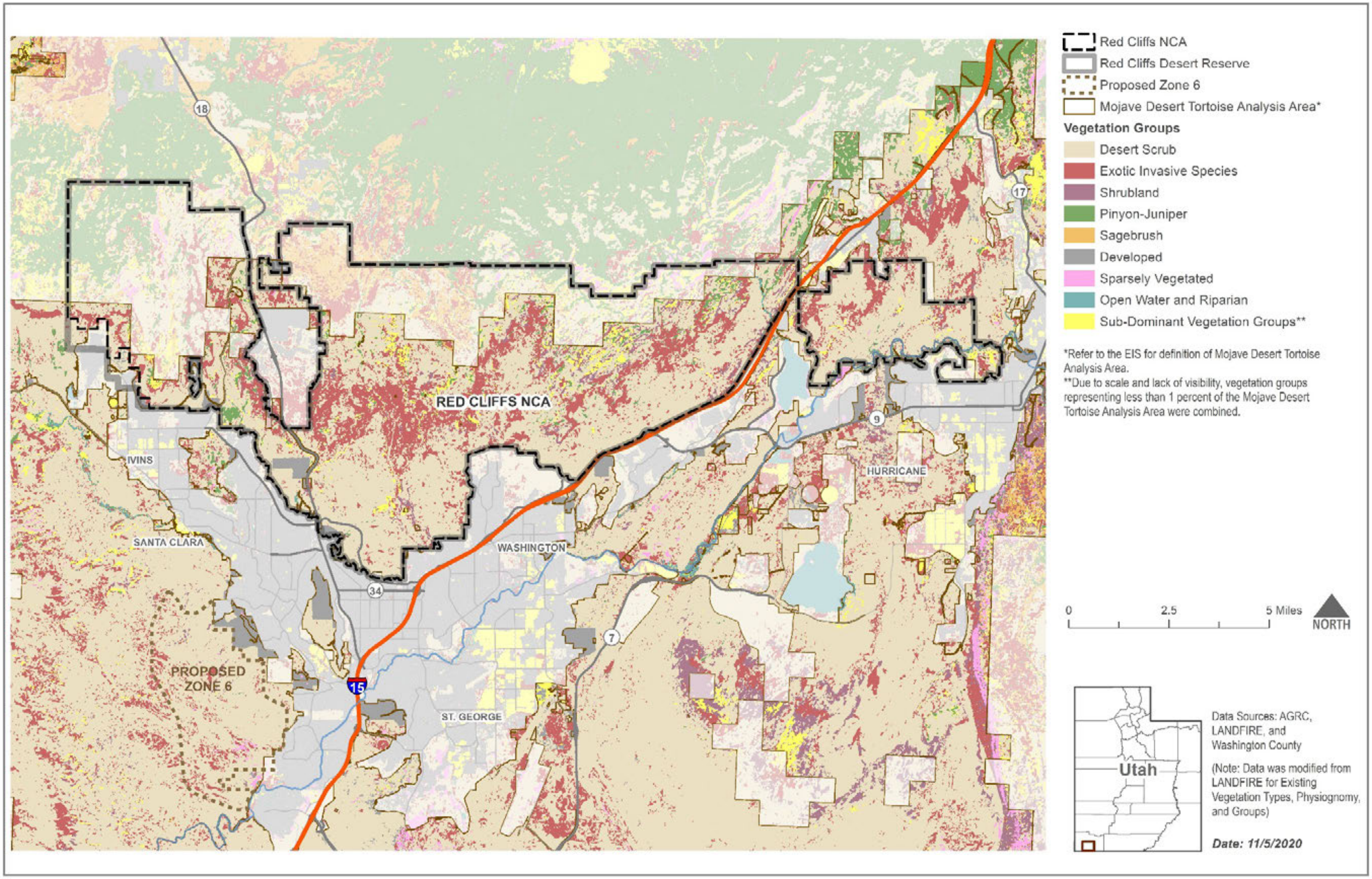
Map 3.2-2a. Dominant Vegetation Community Groups within the Plan Area (1 of 2)



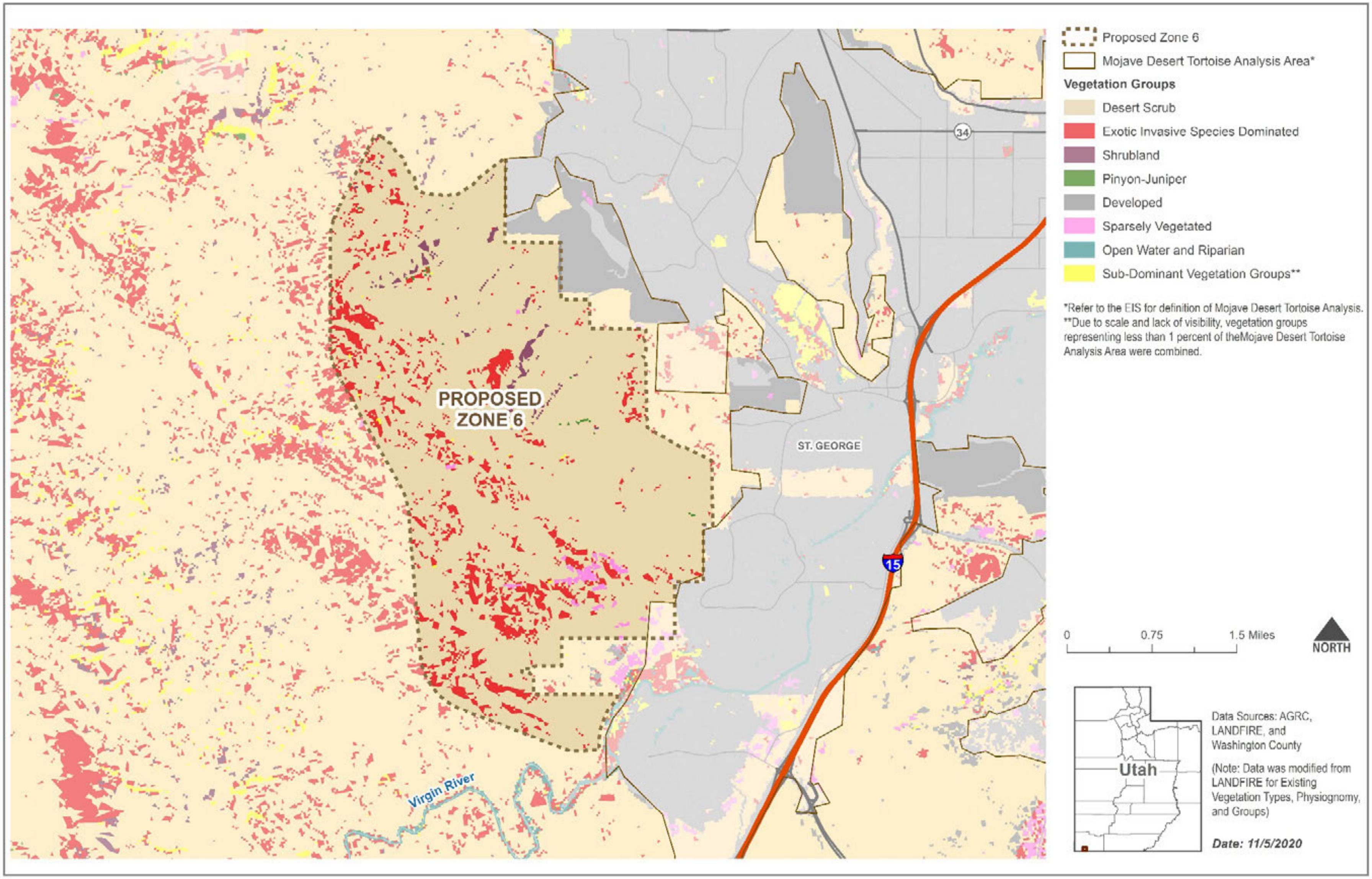
Map 3.2-2b. Dominant Vegetation Community Groups within the Plan Area (2 of 2)



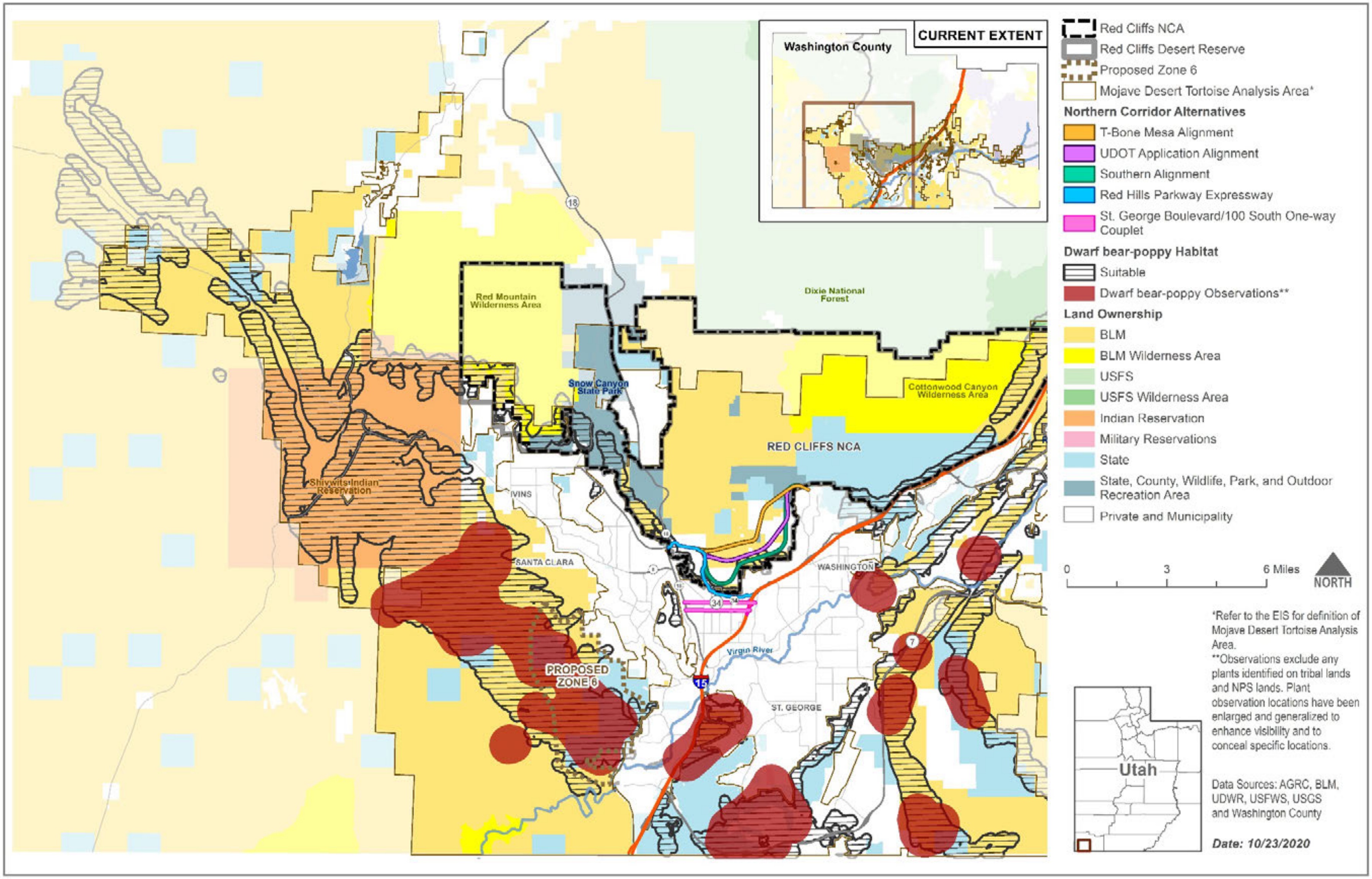
Map 3.2-3. Dominant Vegetation Community Groups within the Red Cliffs NCA



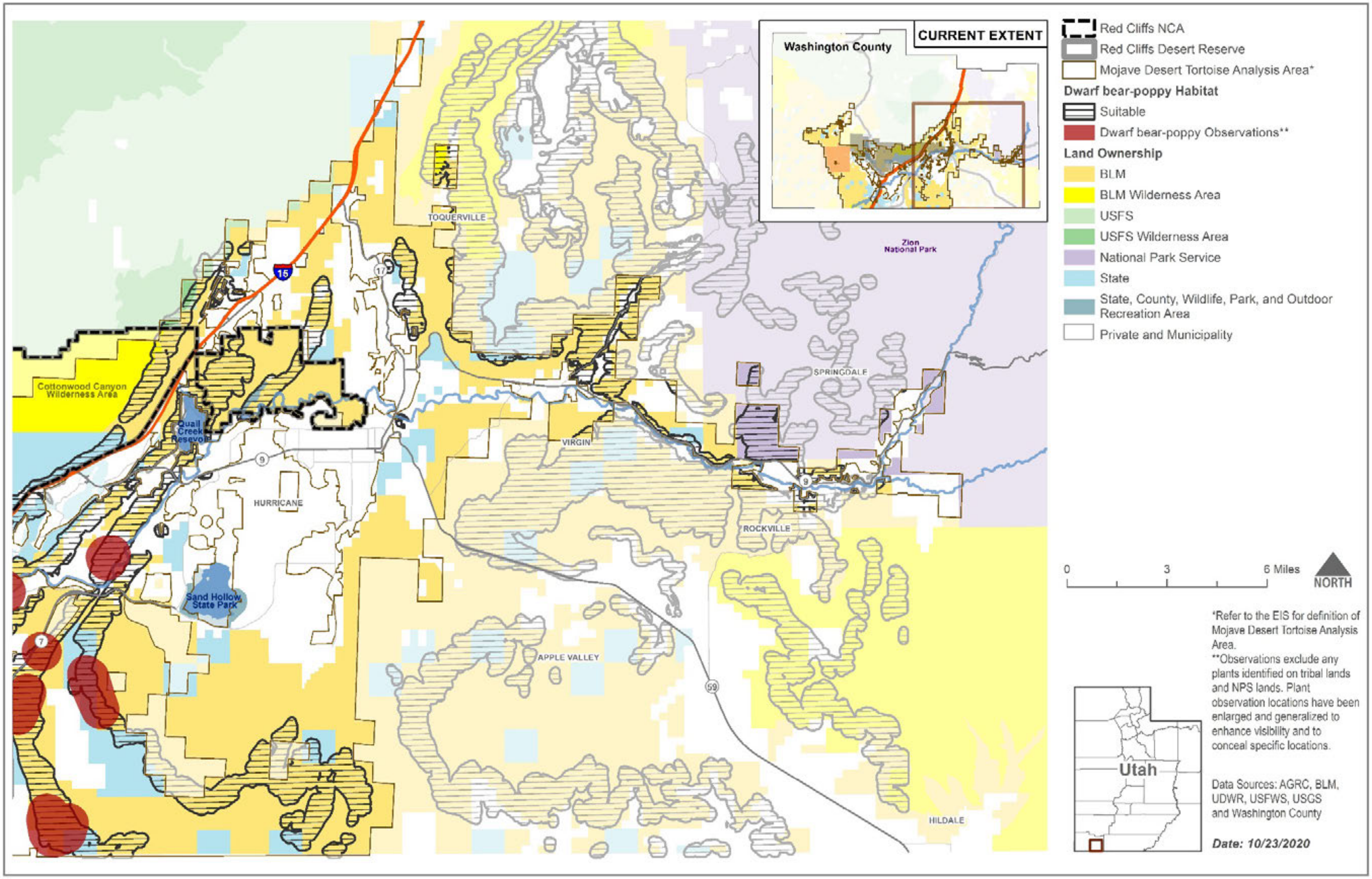
Map 3.2-4. Dominant Vegetation Community Groups within Proposed Zone 6



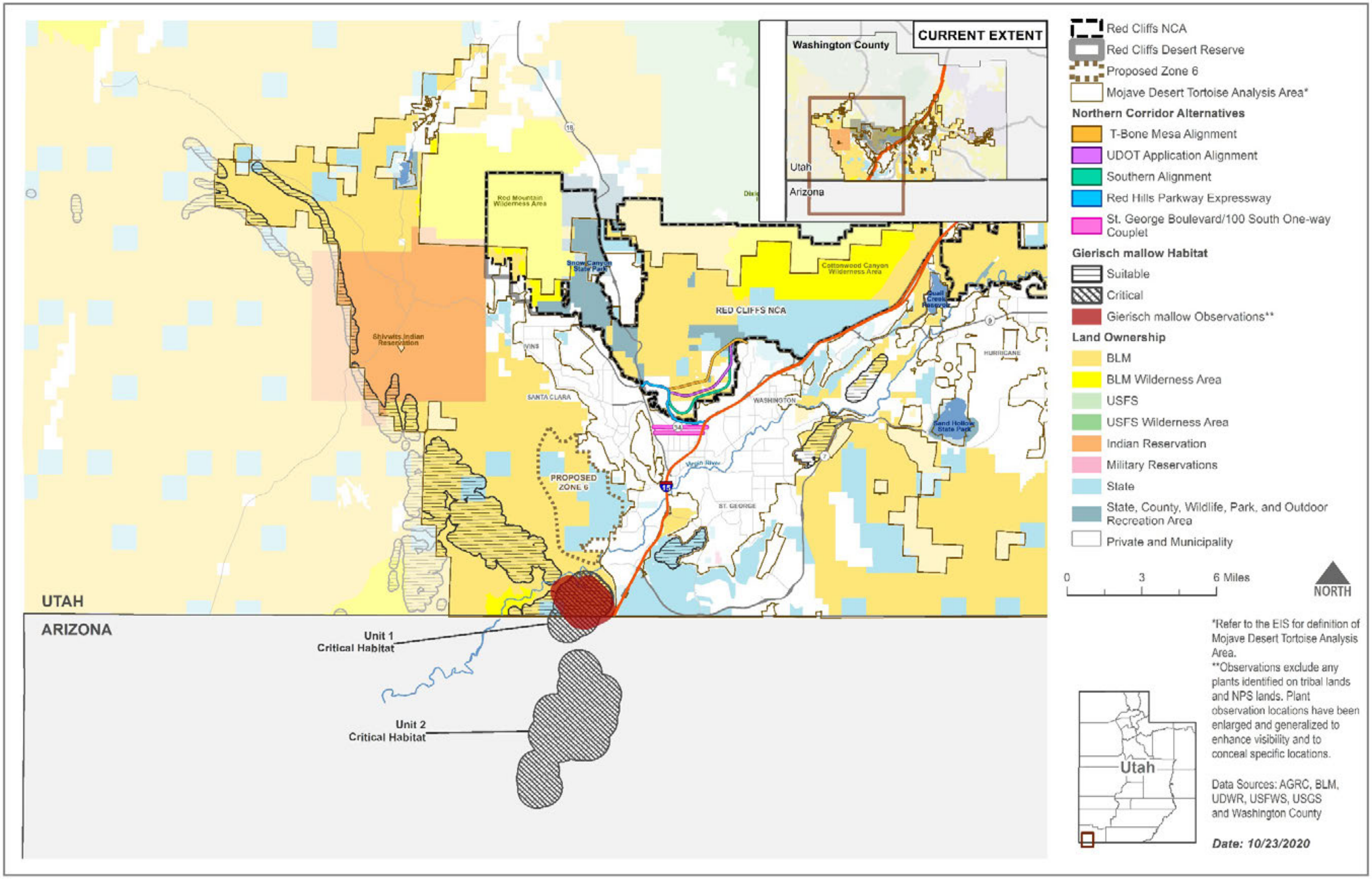
Map 3.3-1a. Special Status Plants – Dwarf Bear-poppy (1 of 2)



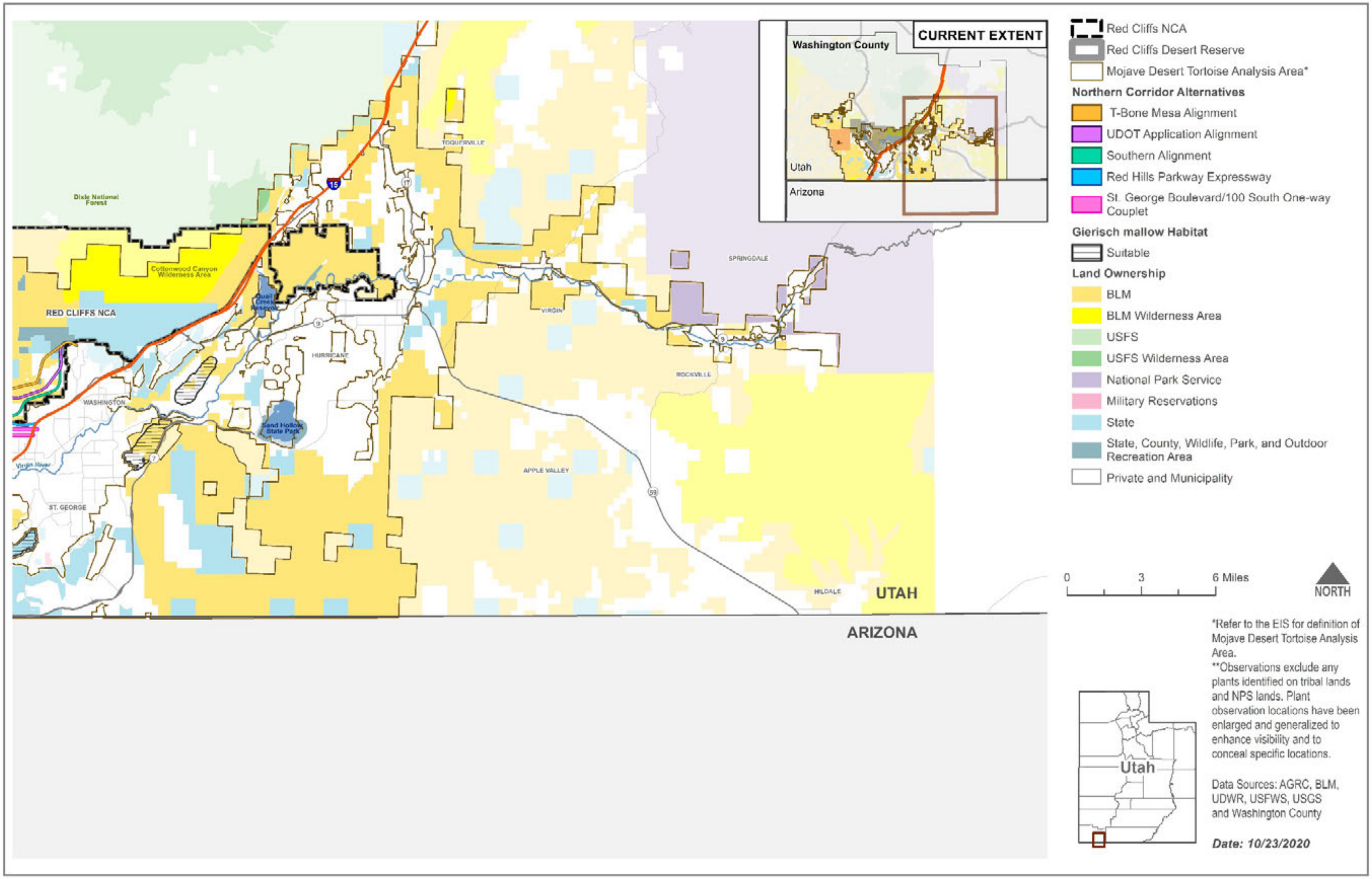
Map 3.3-1b. Special Status Plants – Dwarf Bear-poppy (2 of 2)



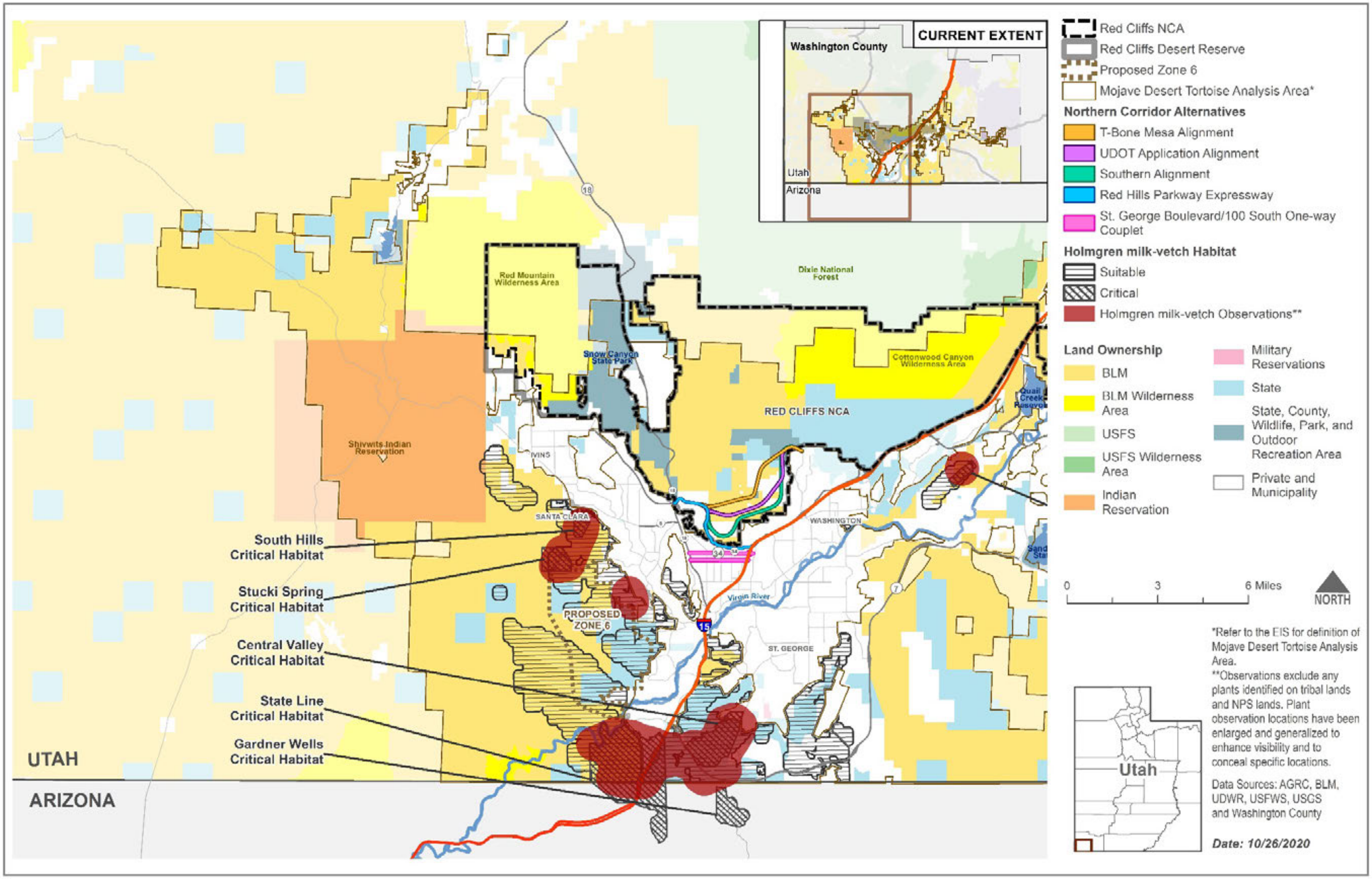
Map 3.3-2a. Special Status Plants - Gierisch Mallow (1 of 2)



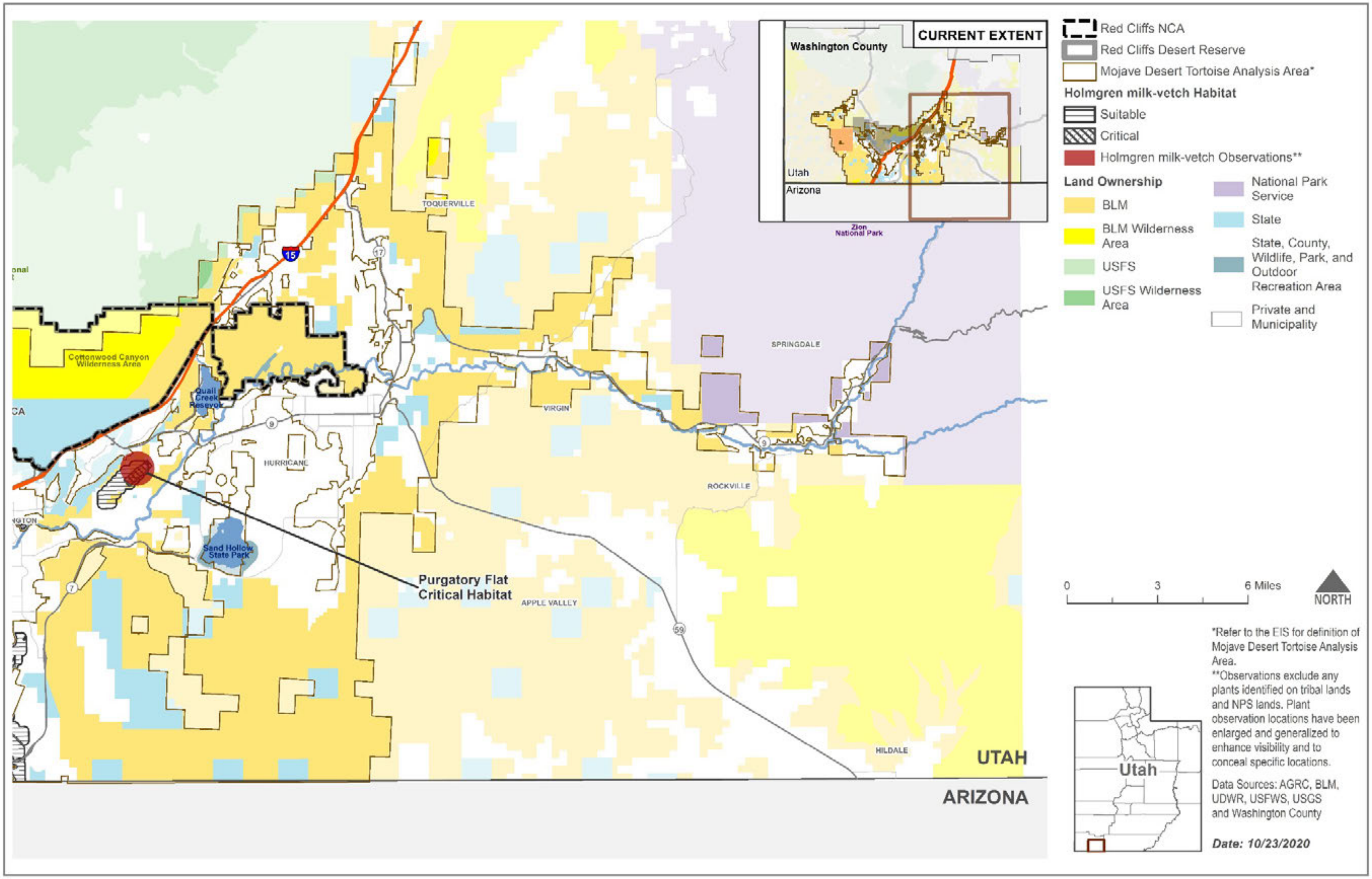
Map 3.3-2b. Special Status Plants - Gierisch Mallow (2 of 2)



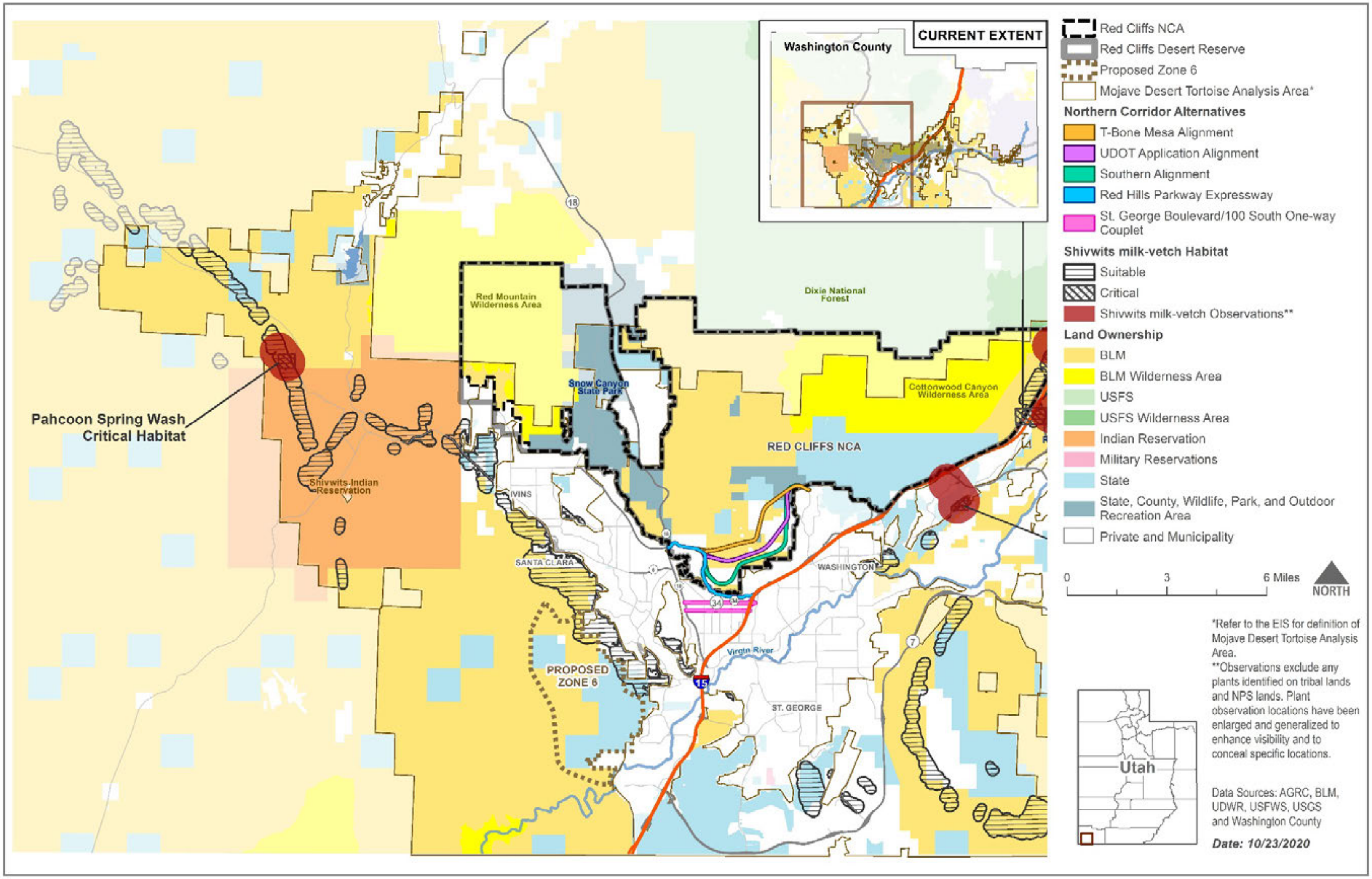
Map 3.3-3a. Special Status Plants - Holmgren Milk-vetch (1 of 2)



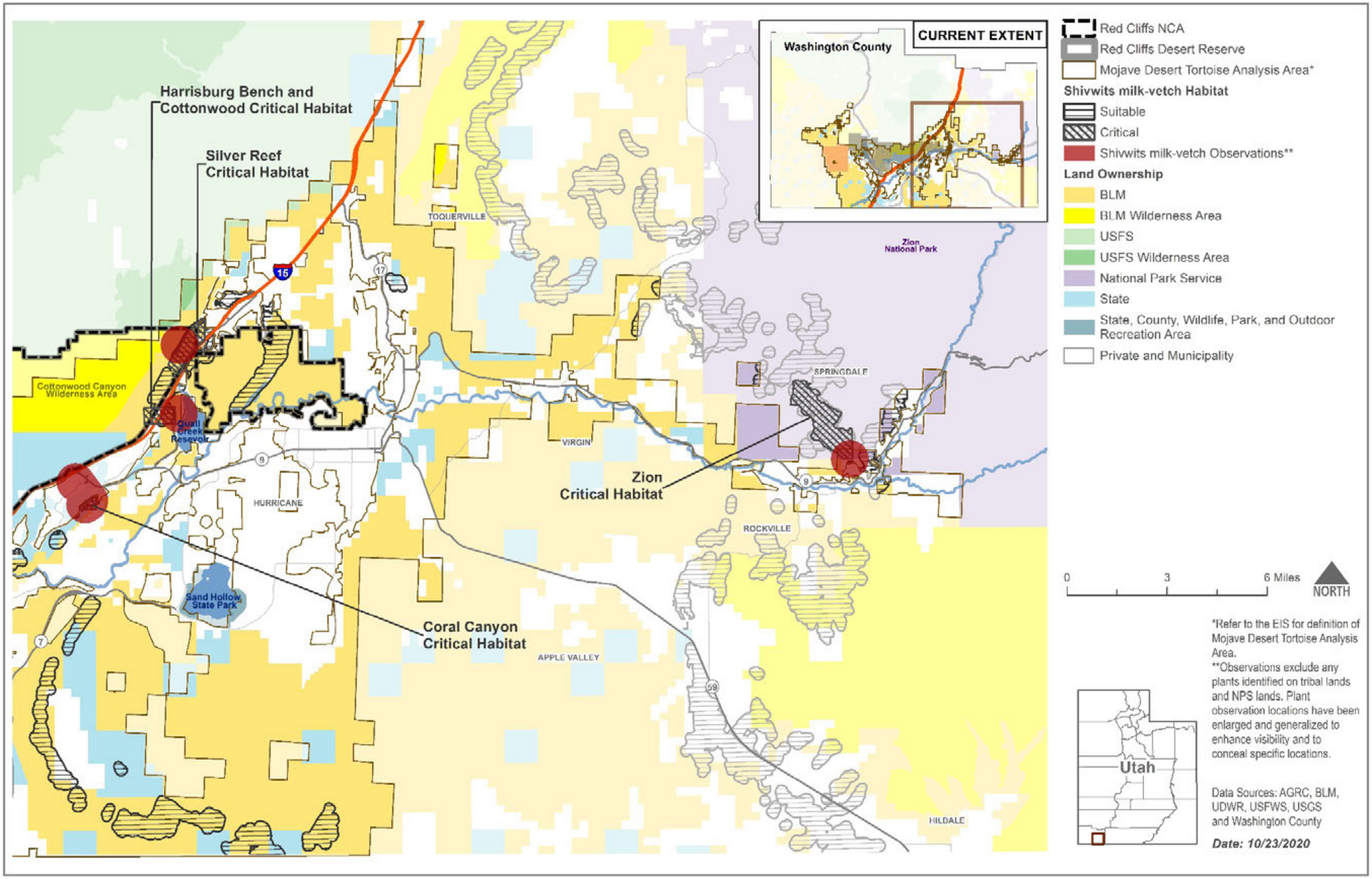
Map 3.3-3b. Special Status Plants - Holmgren Milk-vetch (2 of 2)



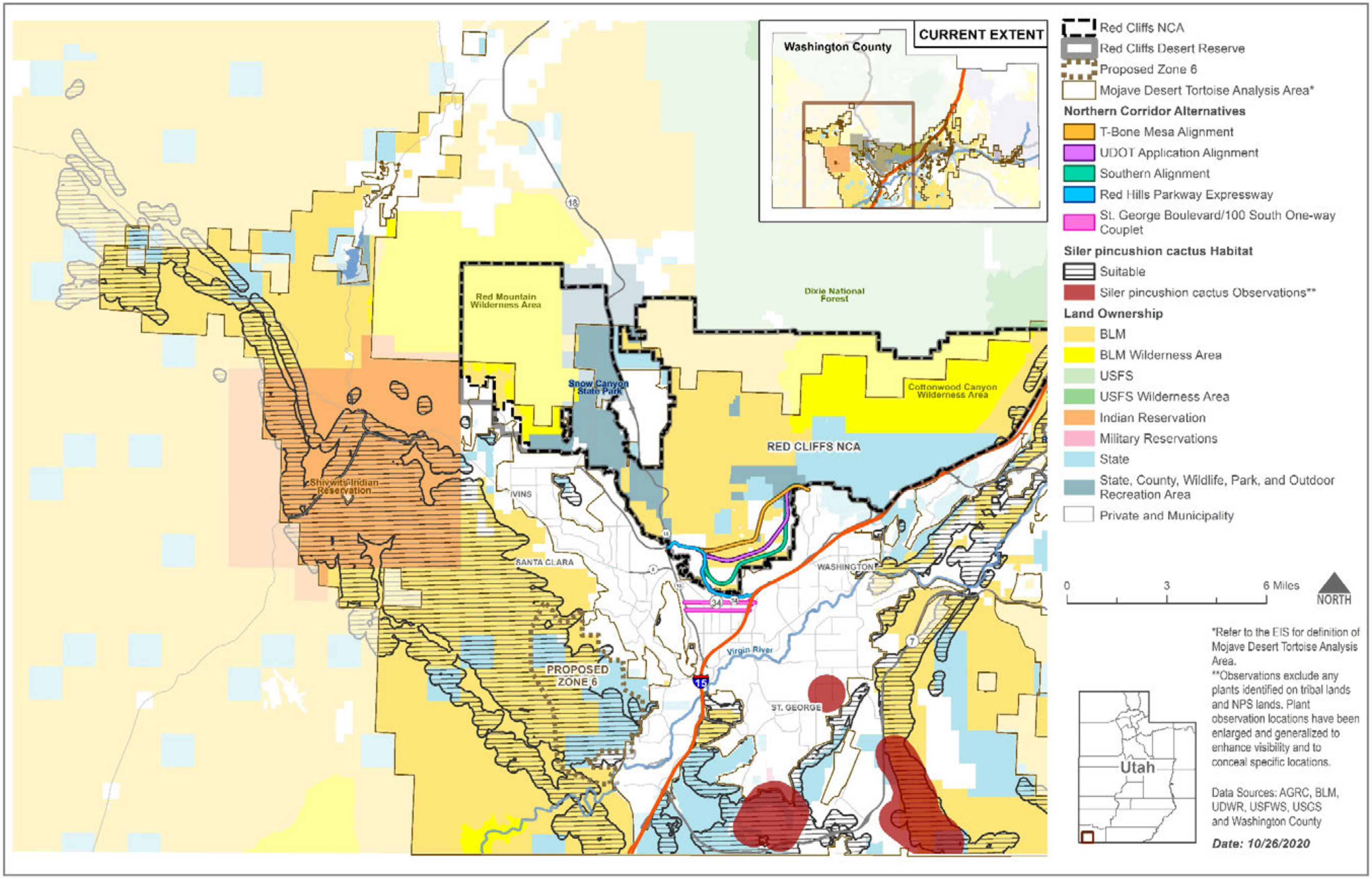
Map 3.3-4a. Special Status Plants - Shivwits Milk-vetch (1 of 2)



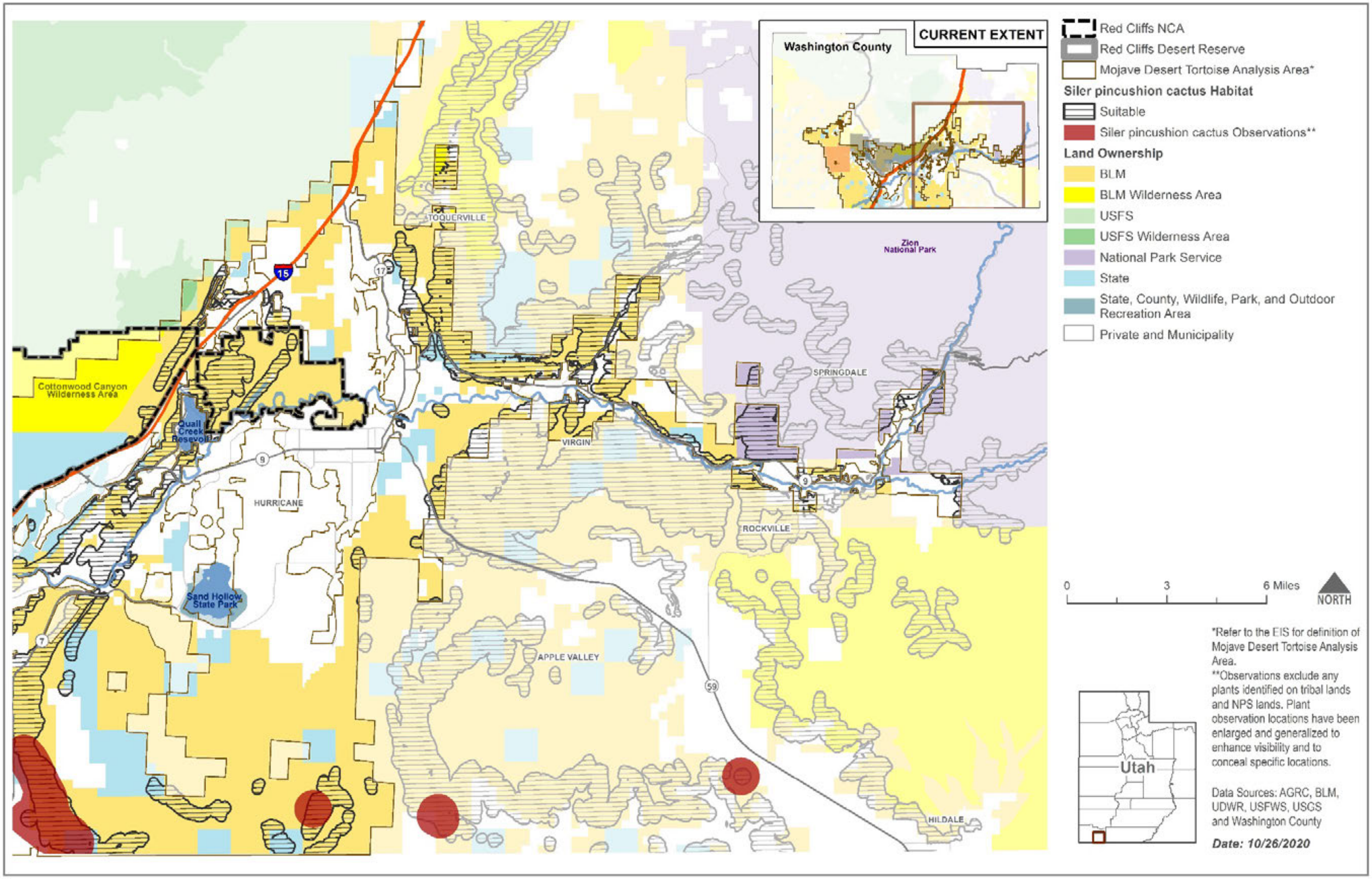
Map 3.3-4b. Special Status Plants - Shivwits Milk-vetch (2 of 2)



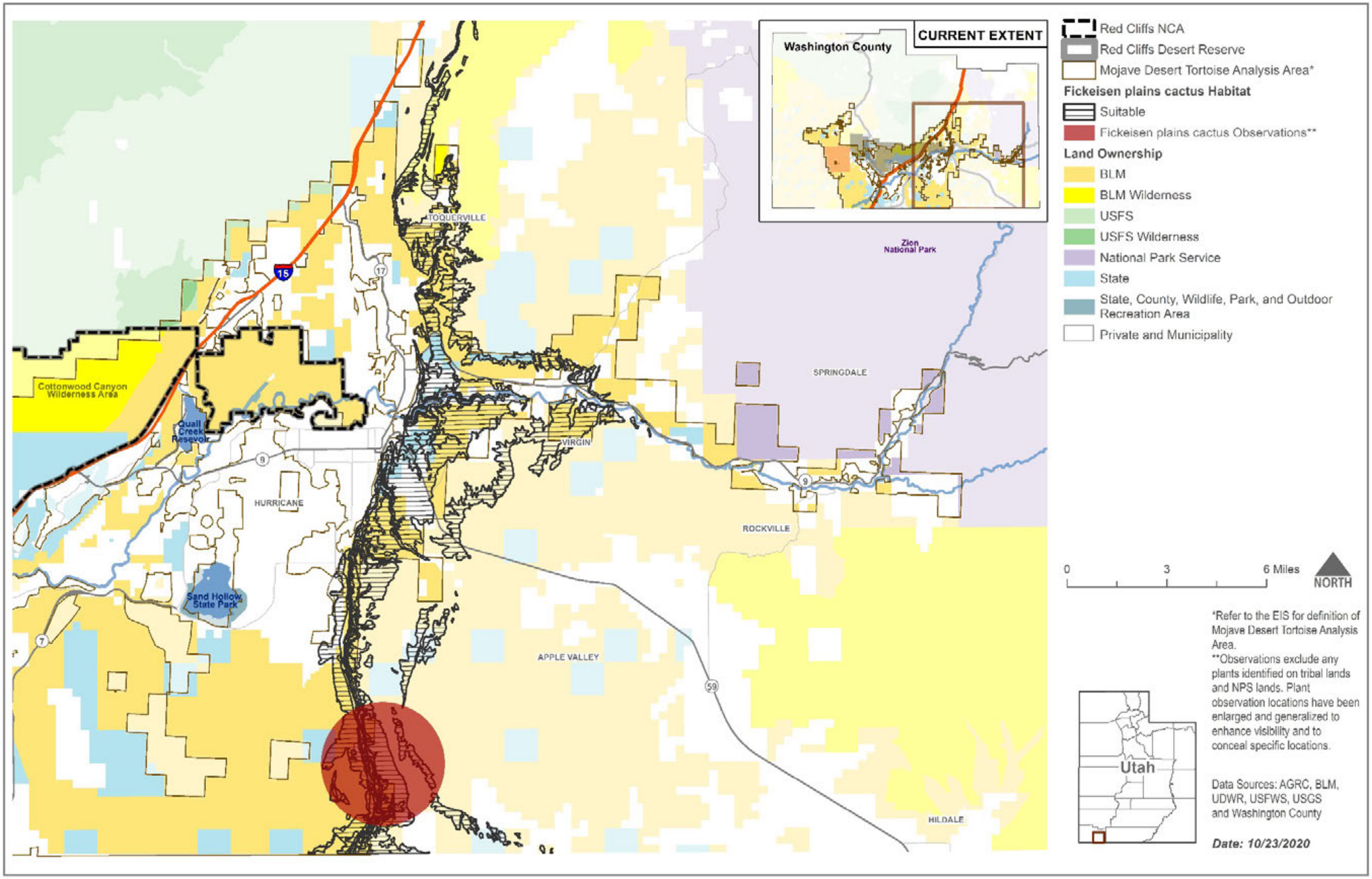
Map 3.3-5a. Special Status Plants - Siler Pincushion Cactus (1 of 2)



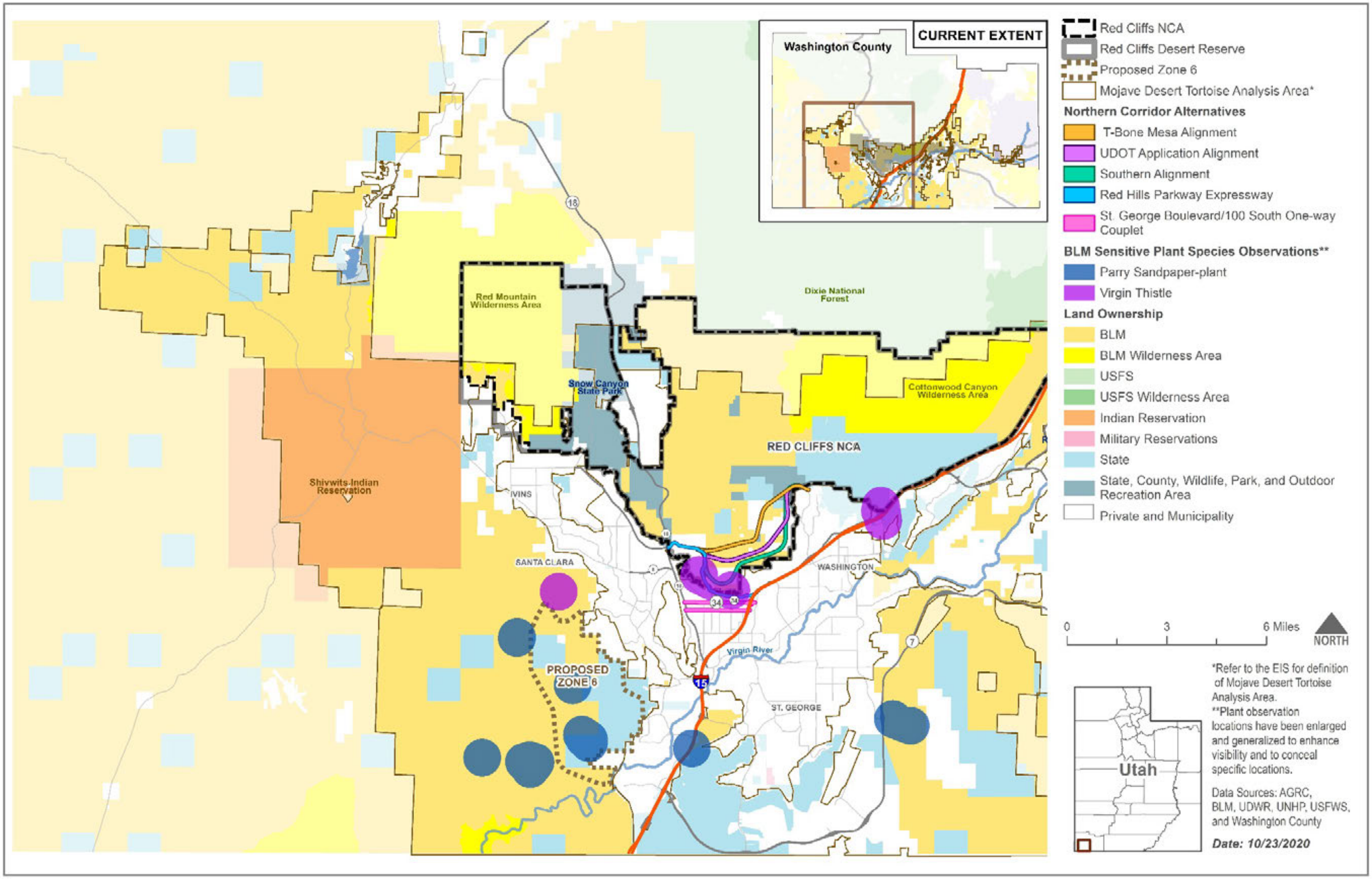
Map 3.3-5b. Special Status Plants - Siler Pincushion Cactus (2 of 2)



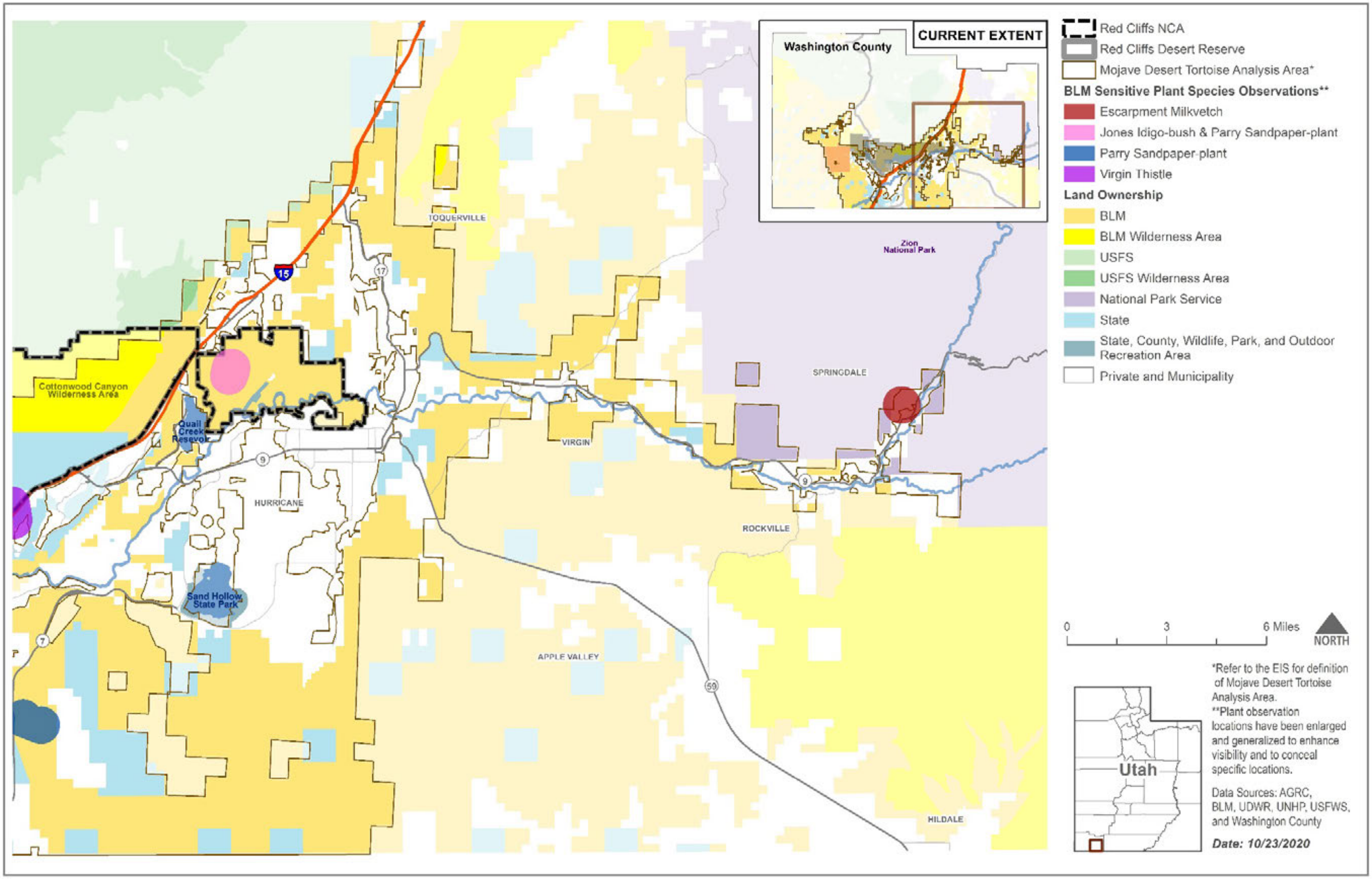
Map 3.3-6. Special Status Plants – Fickeisen Plains Cactus



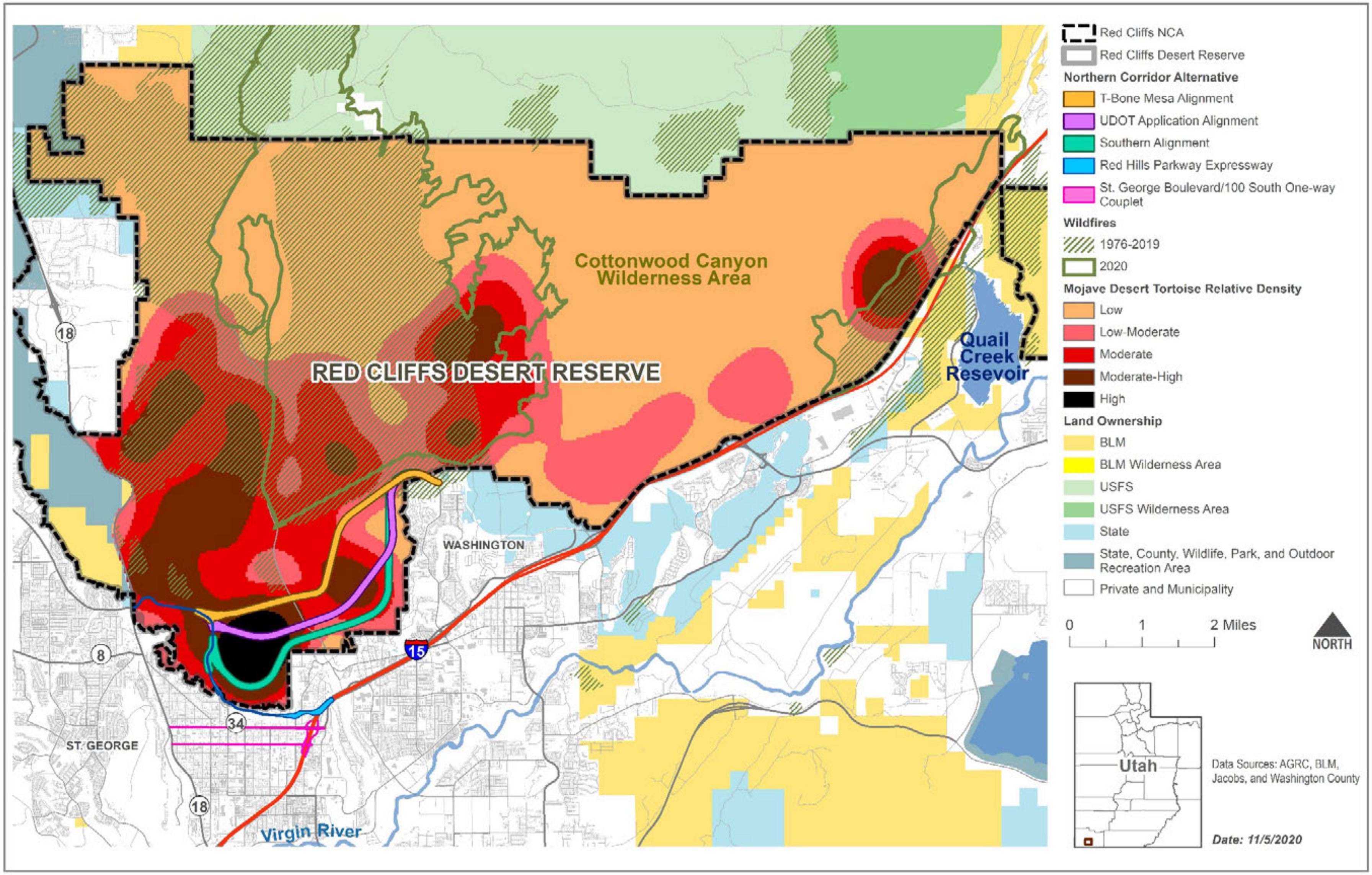
Map 3.3-7a. BLM Sensitive Plant Species (1 of 2)



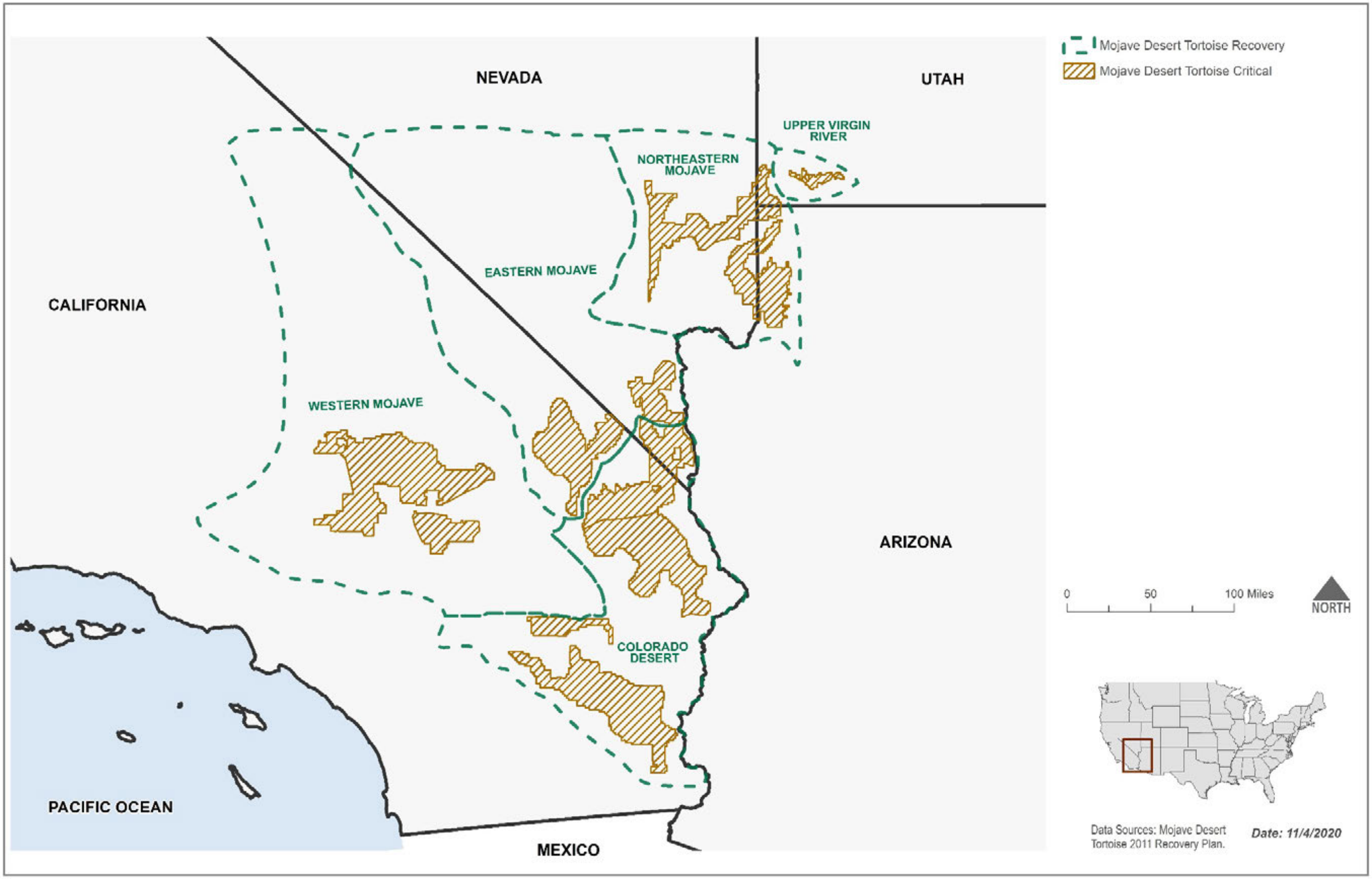
Map 3.3-7b. BLM Sensitive Plant Species (2 of 2)



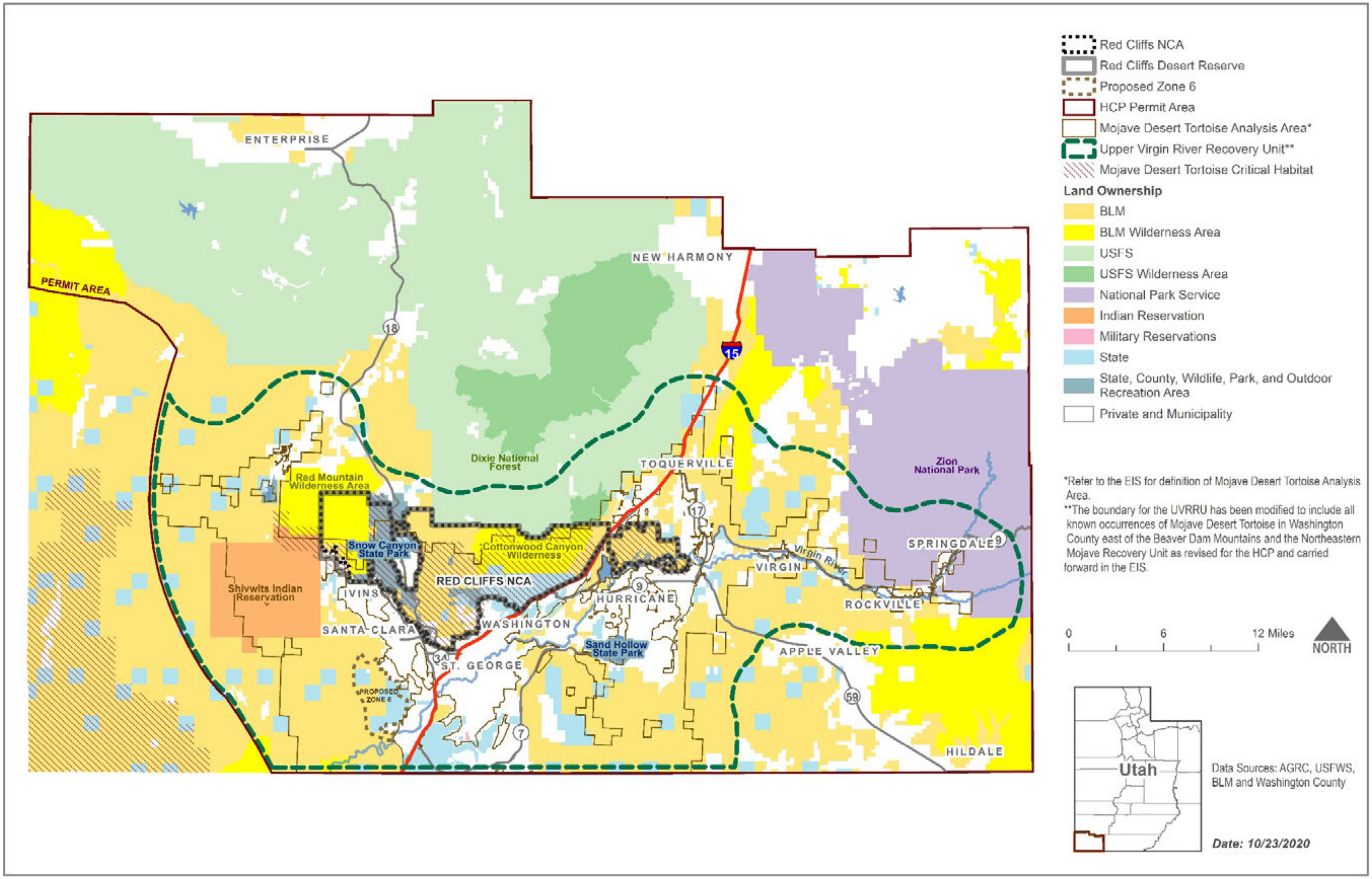
Map 3.5-1. Wildfires, Kernel Density Tortoise Abundance, and Northern Corridor Alignments



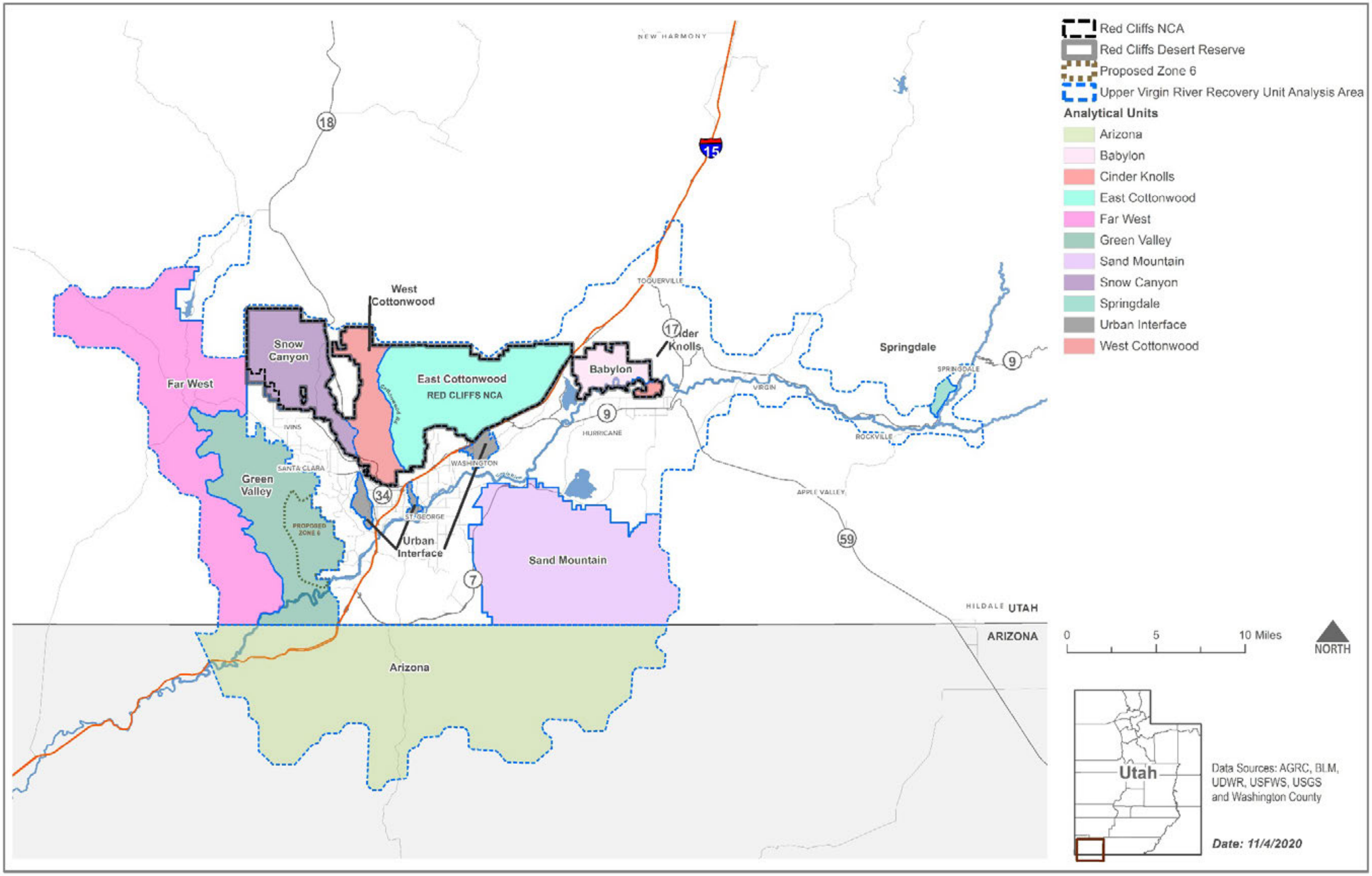
Map 3.5-2. Mojave Desert Tortoise Recovery Units and Critical Habitat Designations



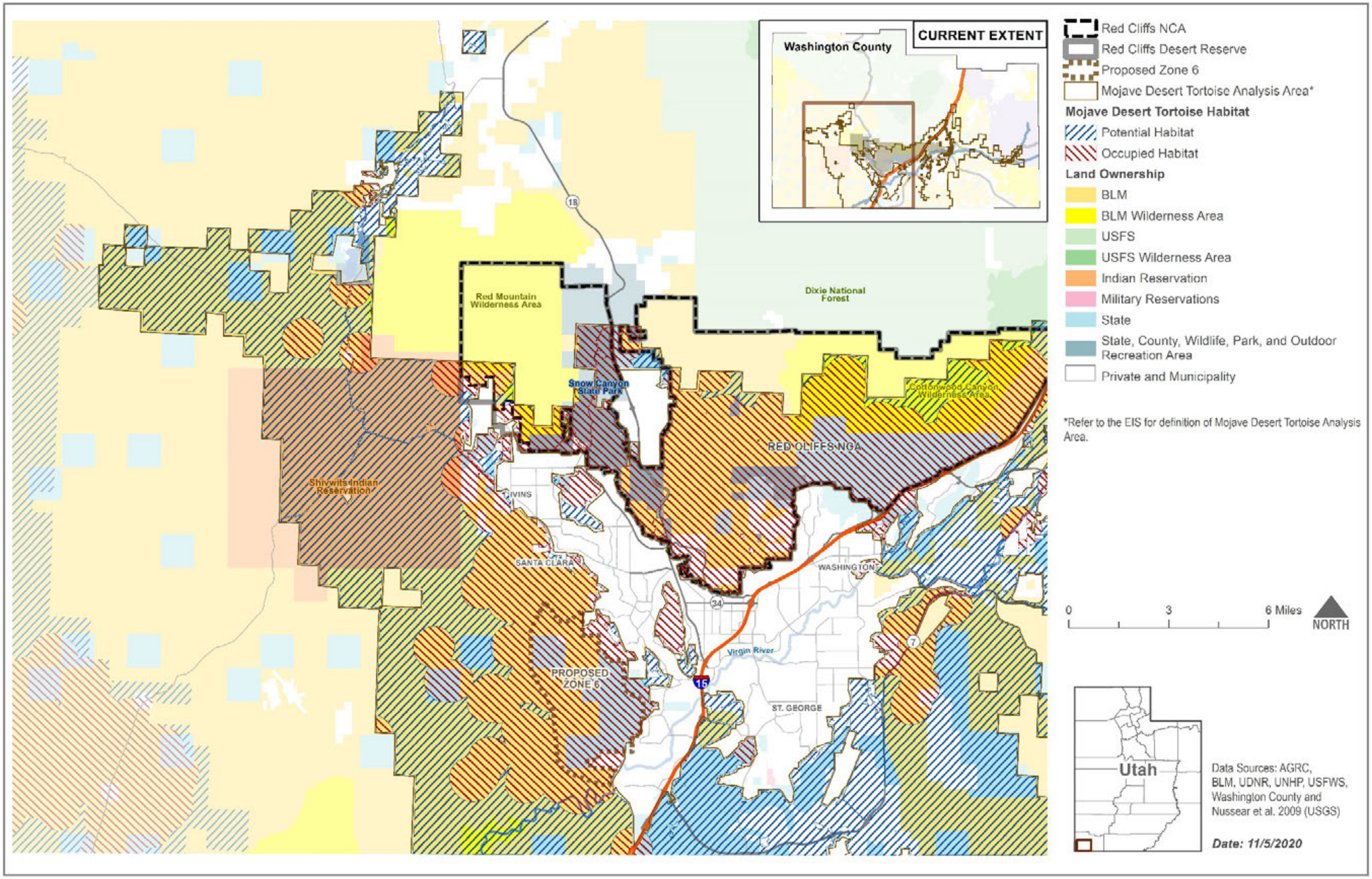
Map 3.5-3. Mojave Desert Tortoise Recovery Units and Critical Habitat Designations - Washington County (Plan Area)



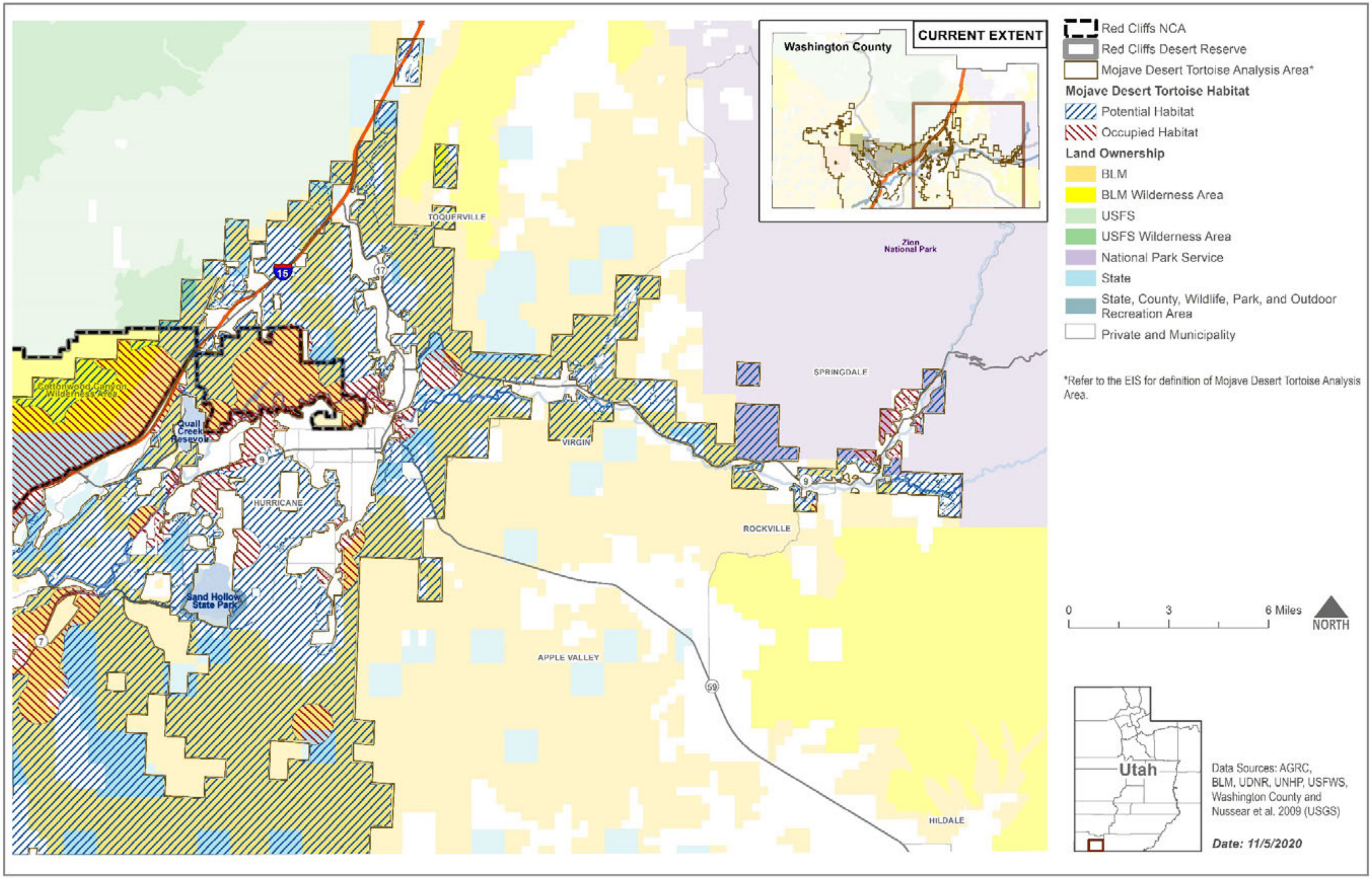
Map 3.5-4. Analytical Units



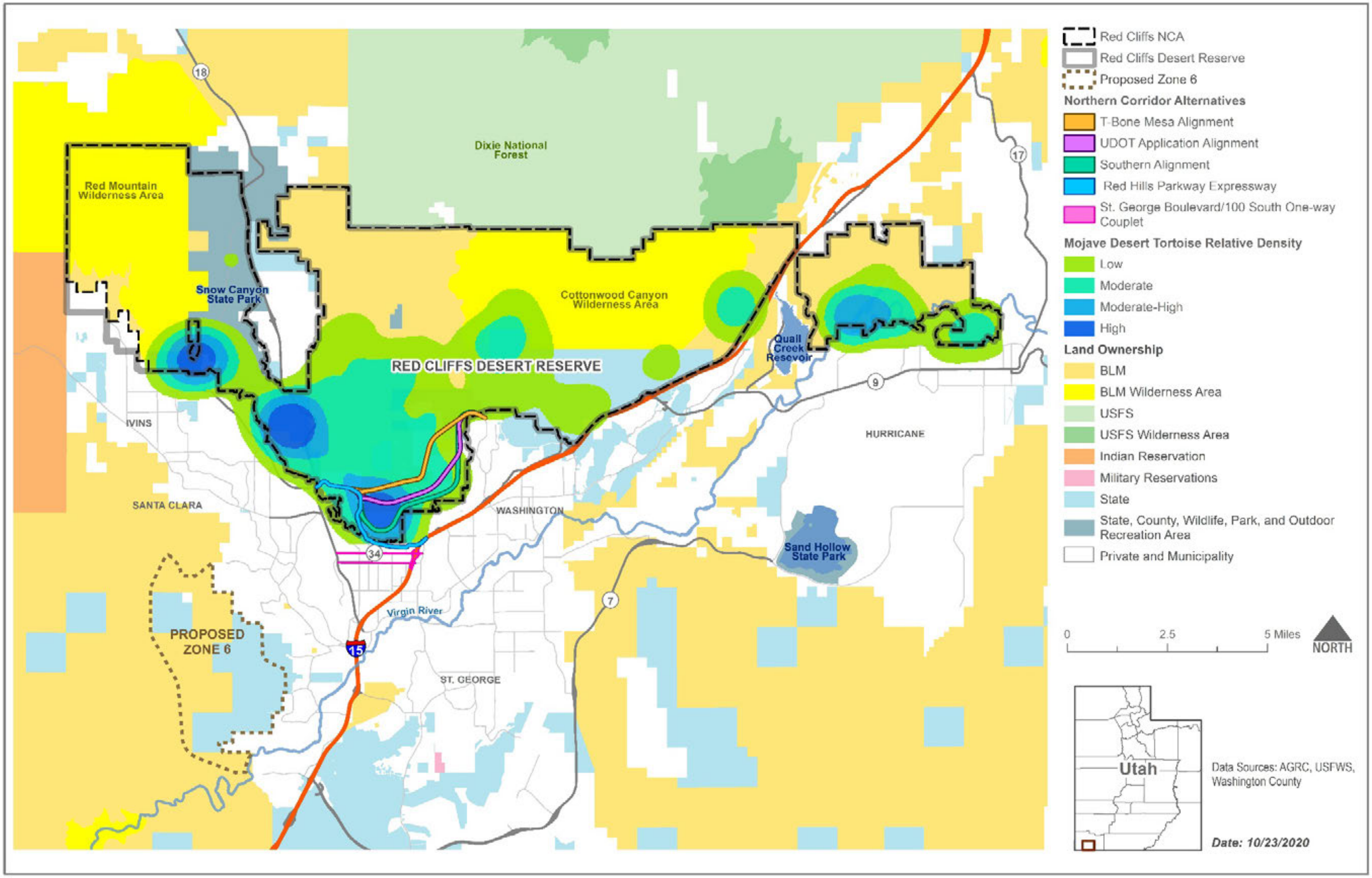
Map 3.5-5a. Occupied and Potential Mojave Desert Tortoise Habitat (1 of 2)



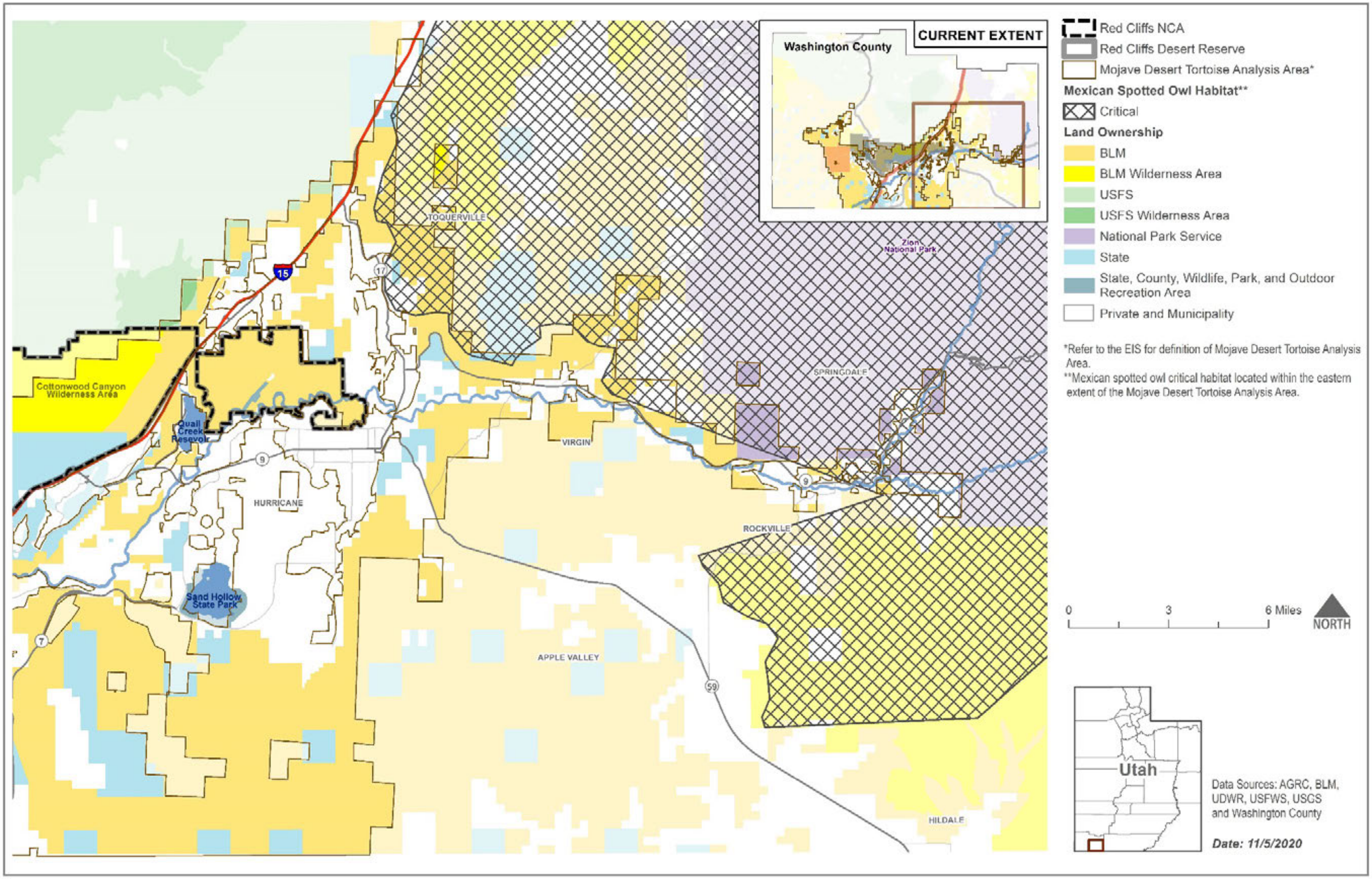
Map 3.5-5b. Occupied and Potential Mojave Desert Tortoise Habitat (2 of 2)



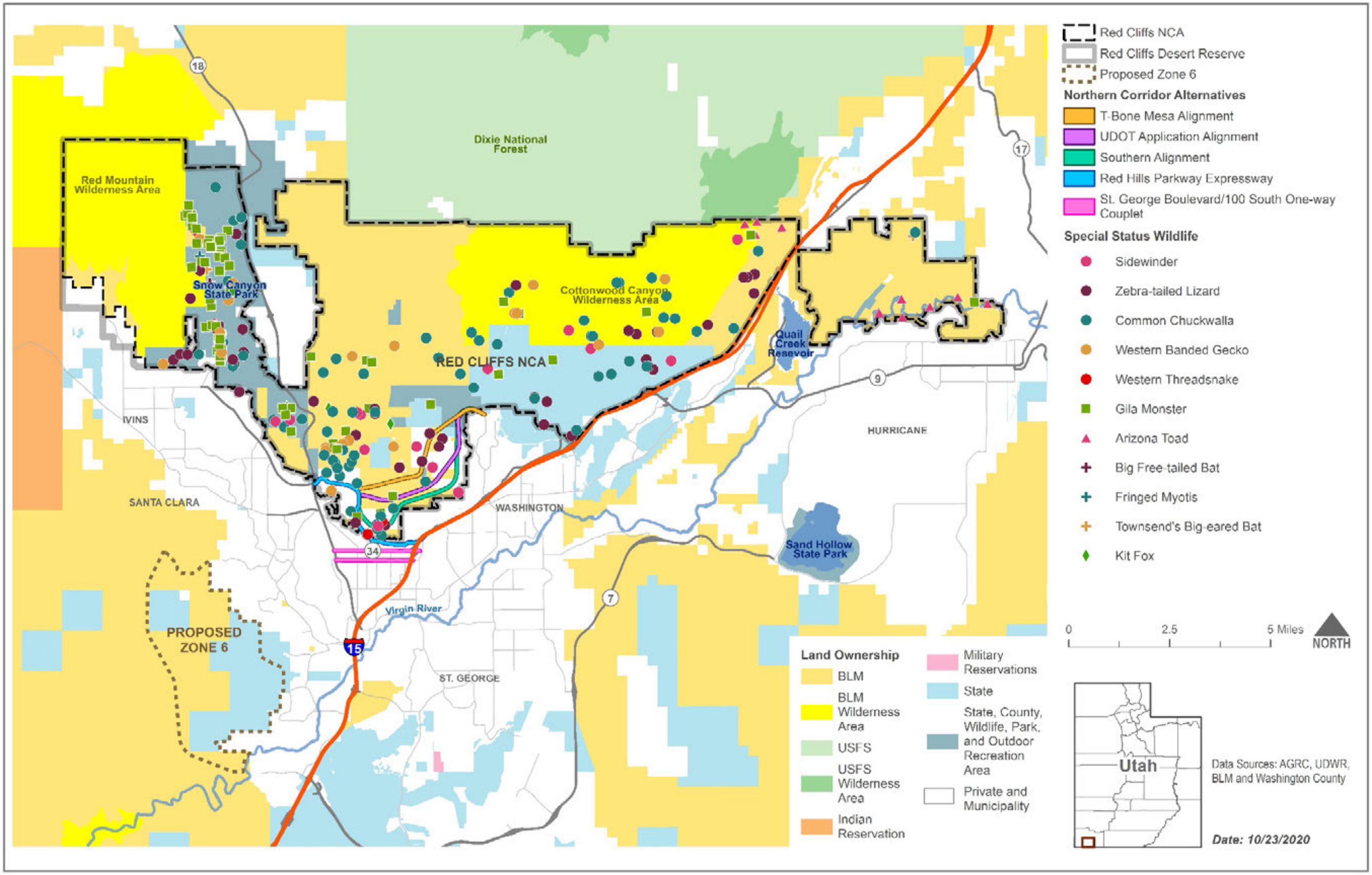
Map 3.5-6. Mojave Desert Tortoise Relative Density in the Reserve



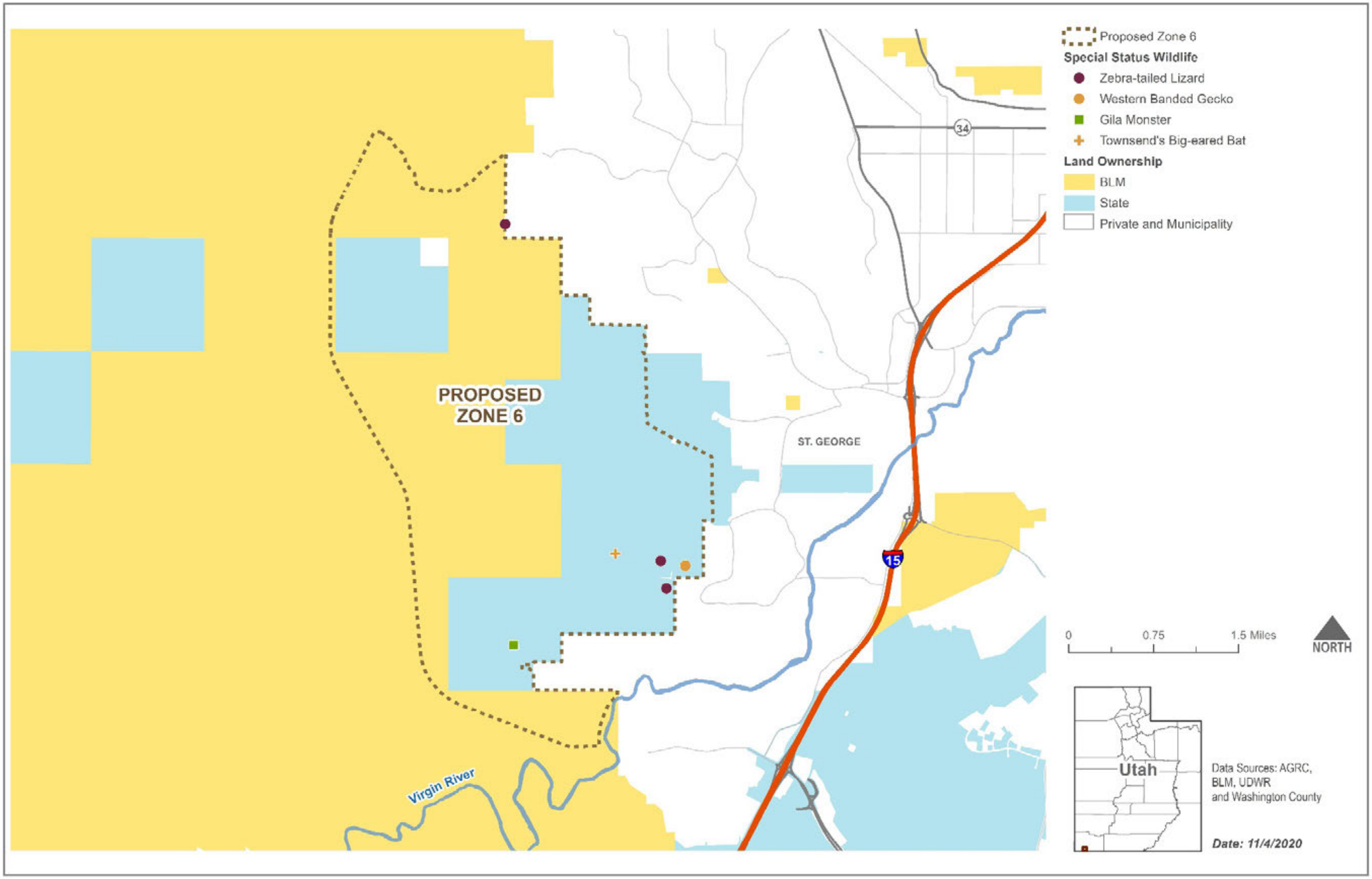
Map 3.5-7. Mexican Spotted Owl Designated Critical Habitat



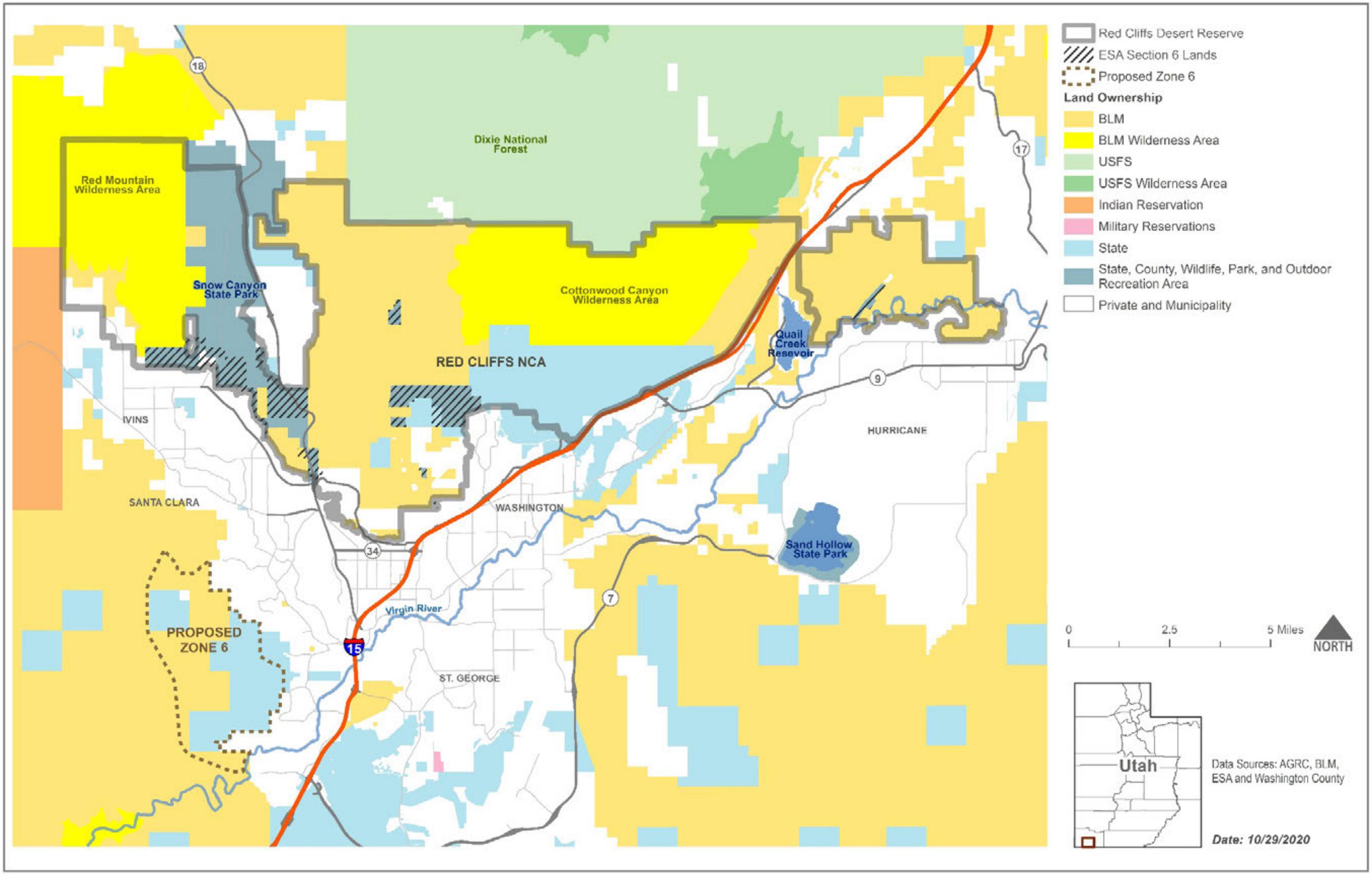
Map 3.5-8. Special Status Wildlife Species within the Reserve



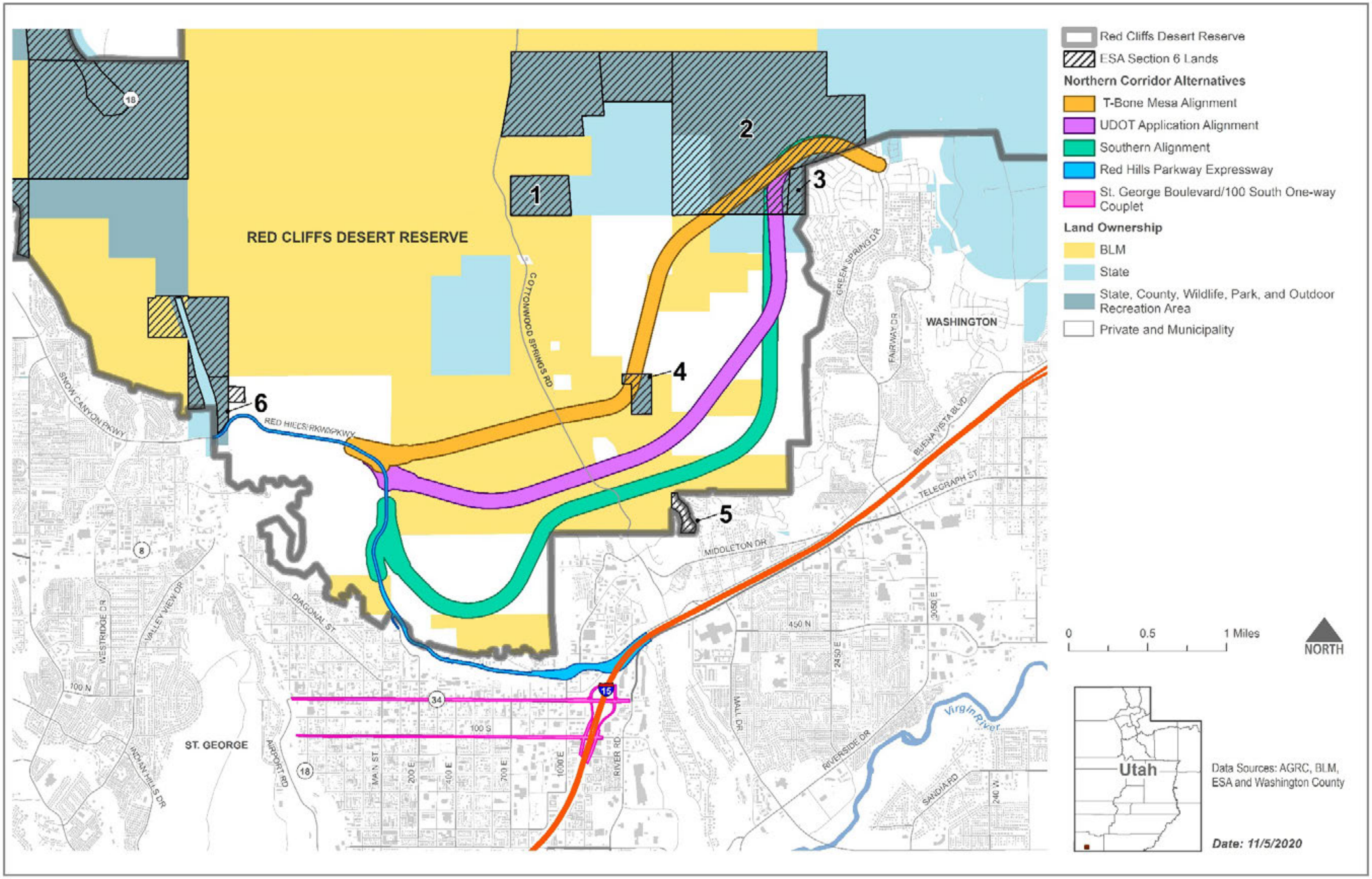
Map 3.5-9. Special Status Wildlife Species within Proposed Zone 6



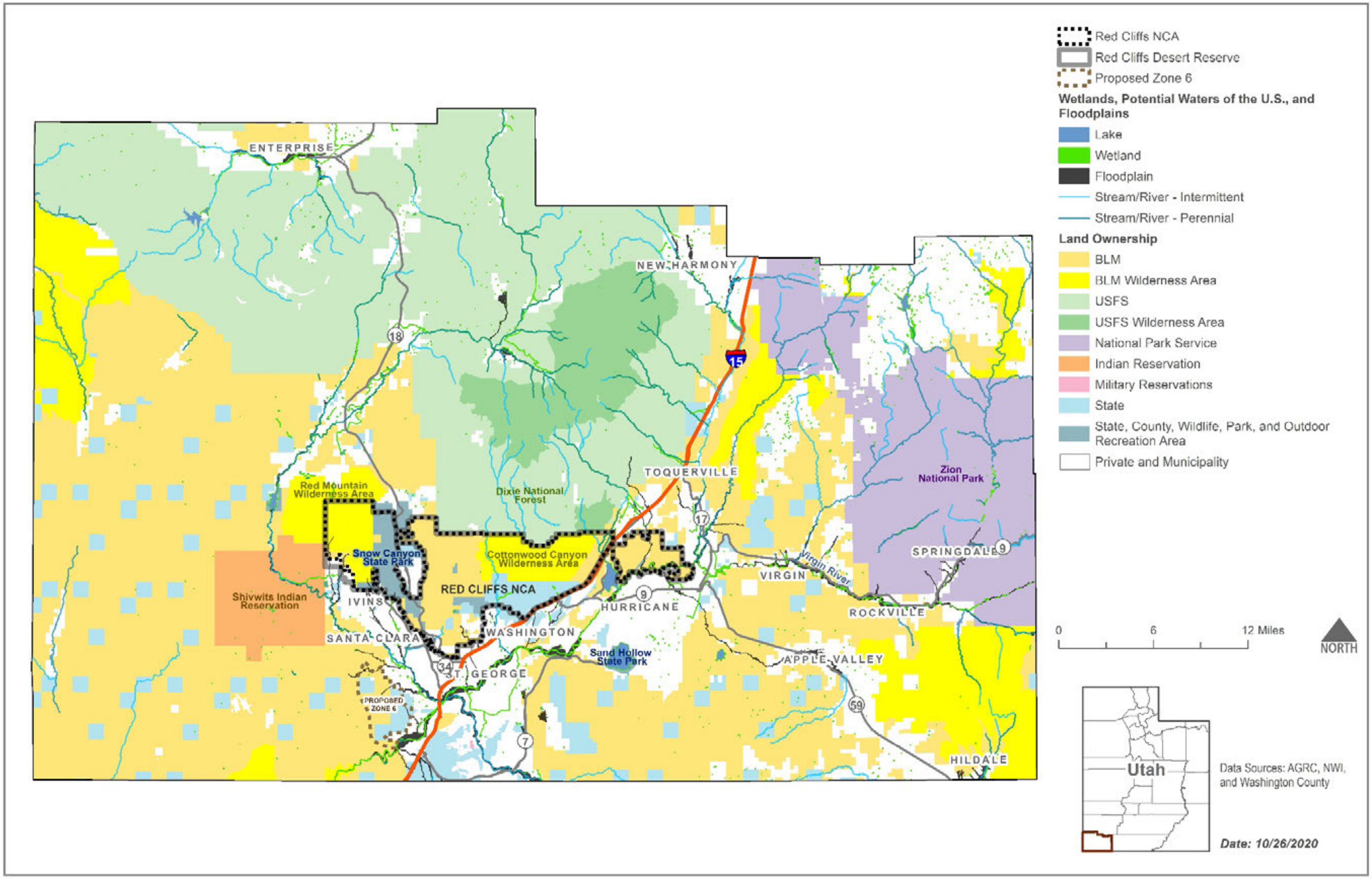
Map 3.6-1. ESA Section 6 Lands within the Reserve



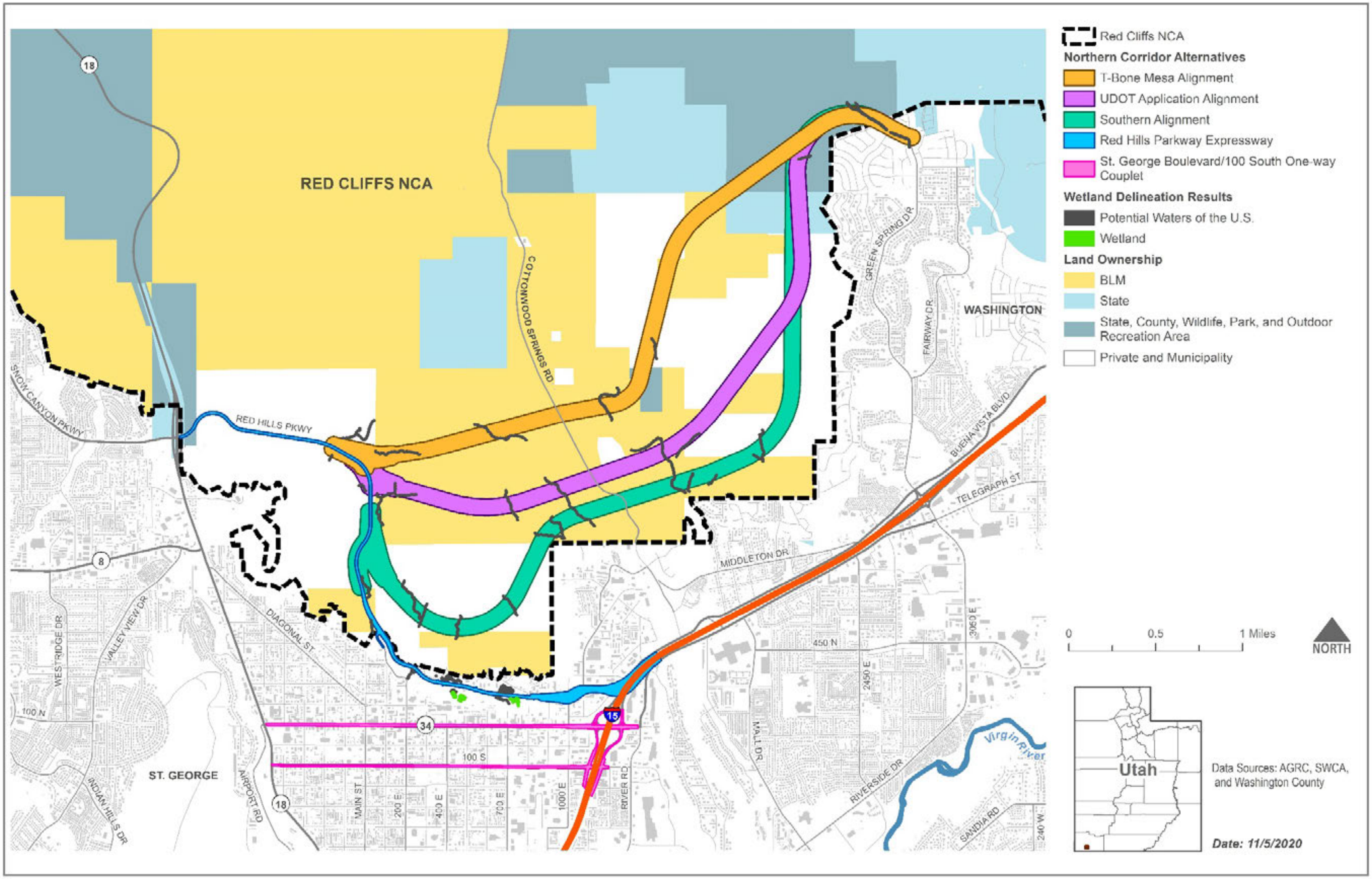
Map 3.6-2. Northern Corridor ESA Section 6 Land Impacts



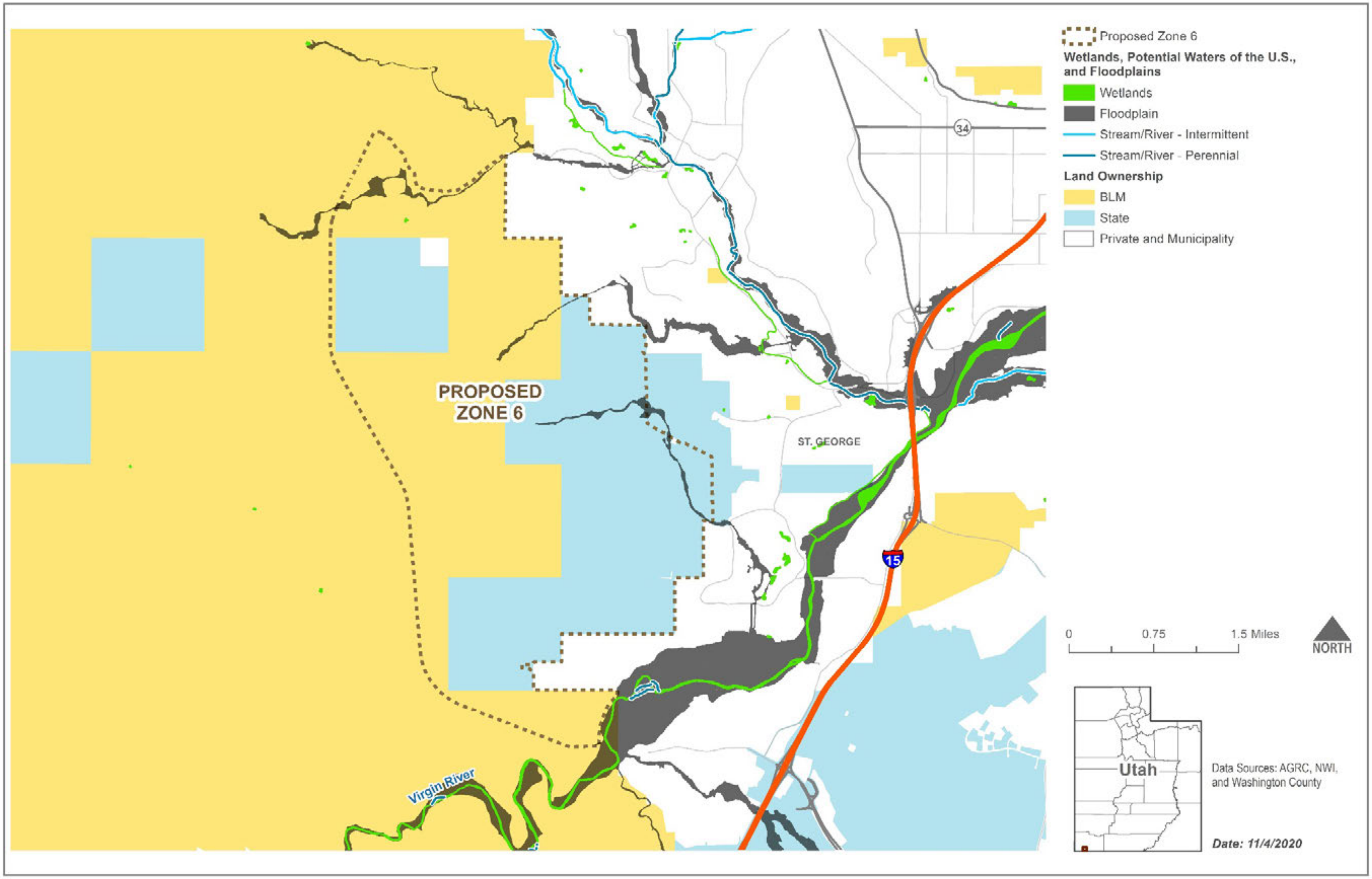
Map 3.10-1. Wetlands, Waters of the U.S., and Floodplains within Washington County



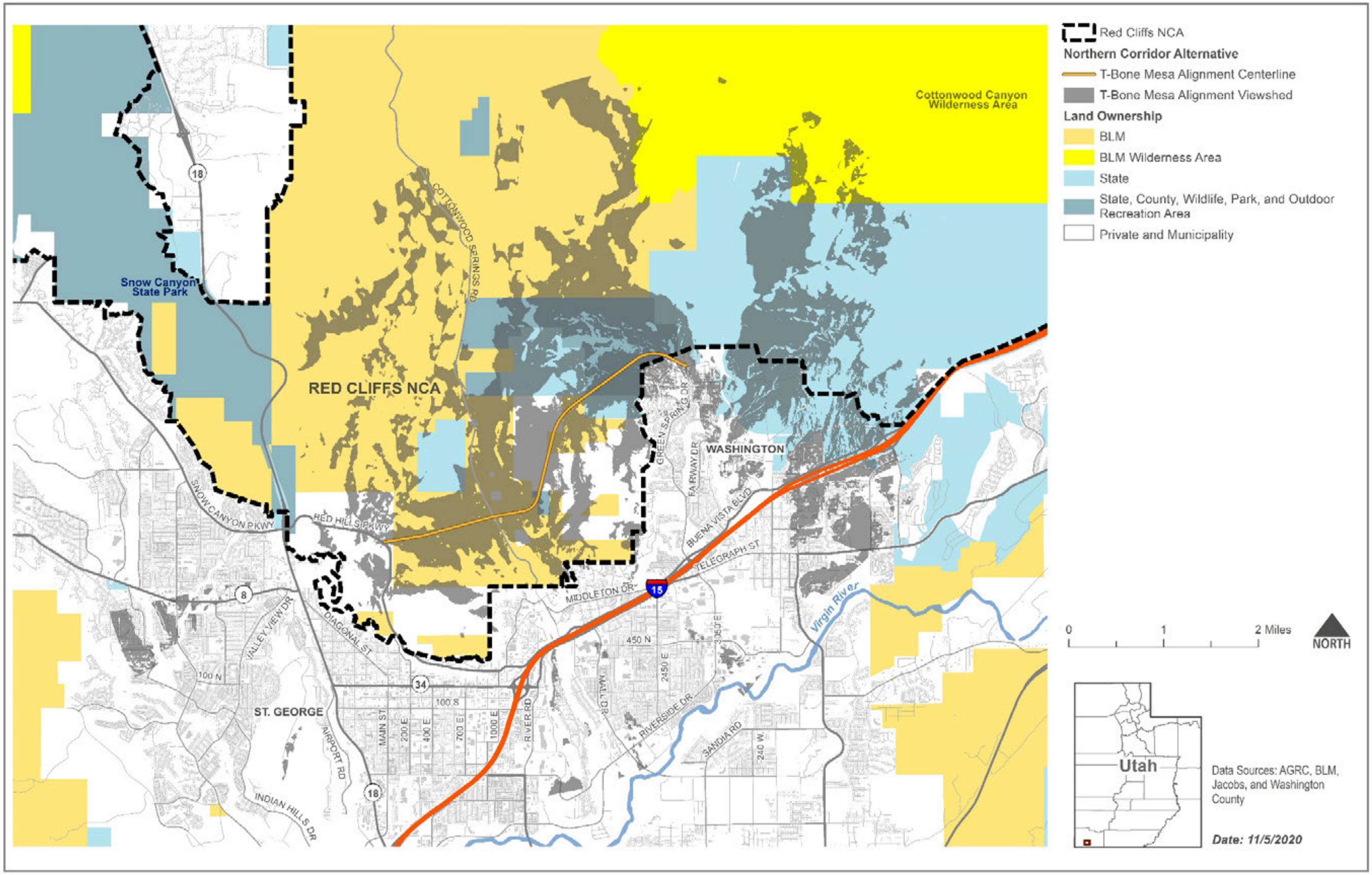
Map 3.10-2. Wetlands and Waters of the U. S. Delineation Results



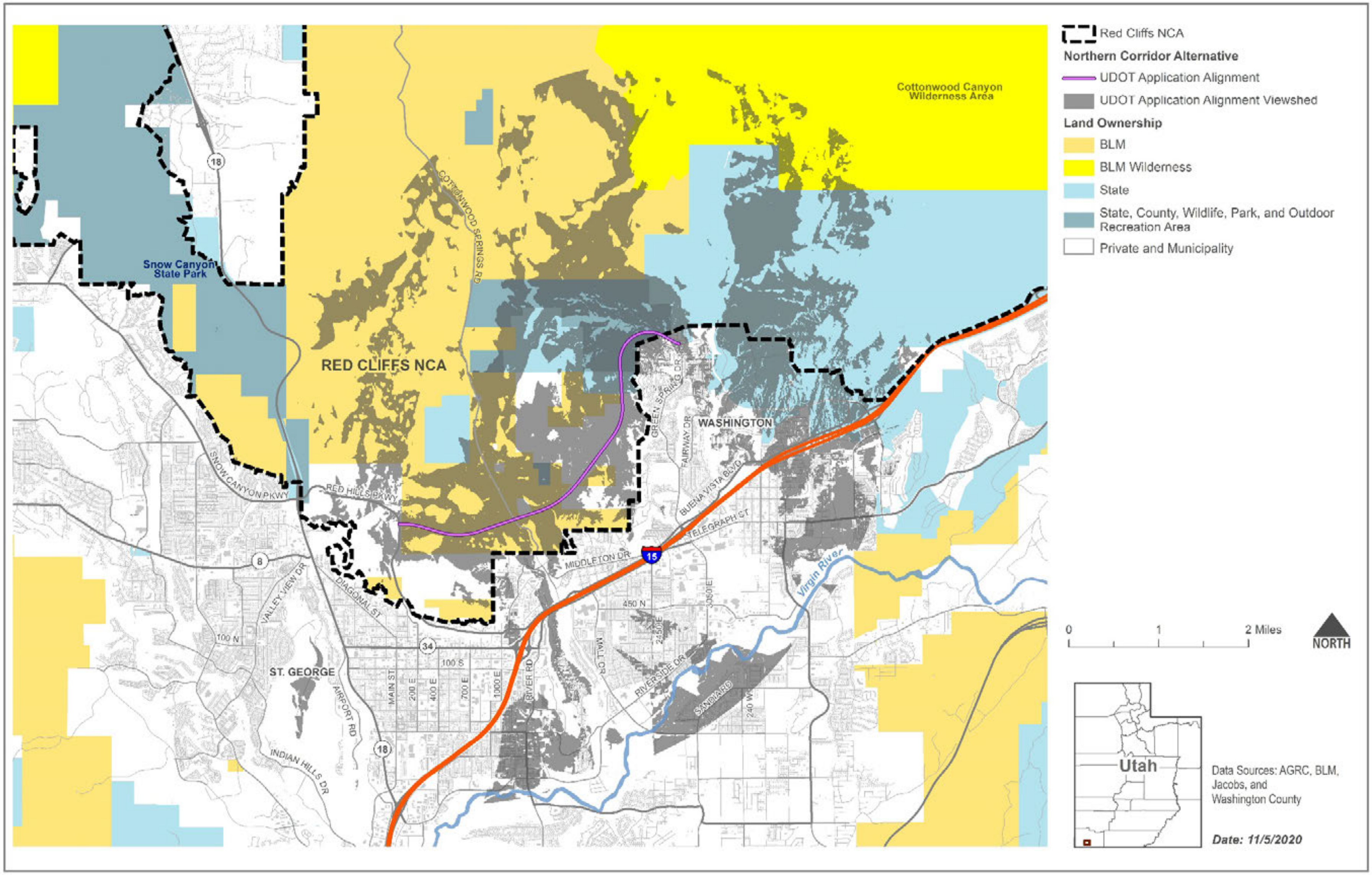
Map 3.10-3. Wetlands, Waters of the U.S., and Floodplains within Proposed Zone 6



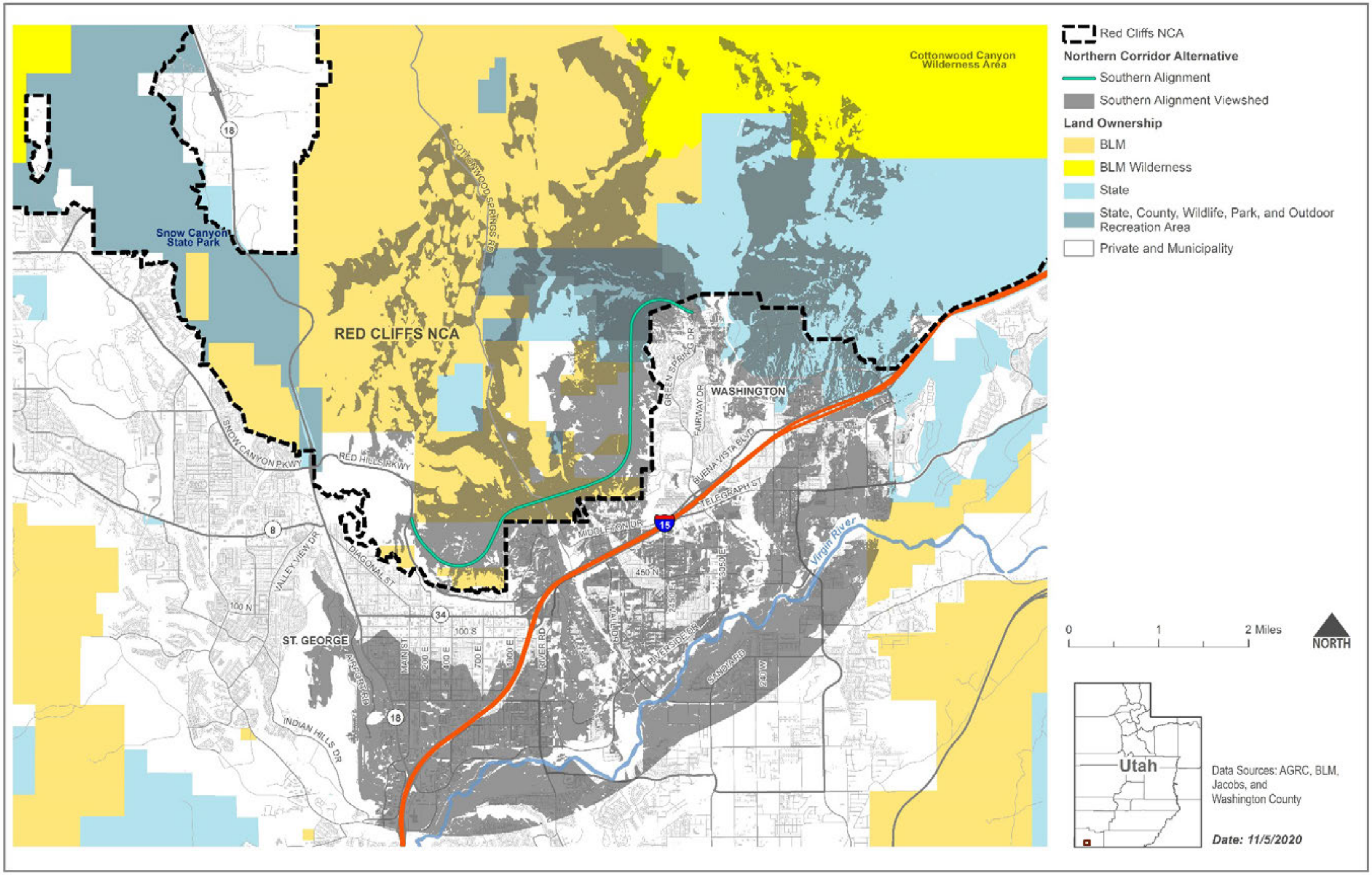
Map 3.13-1a. Visibility Map: T-Bone Mesa Alignment



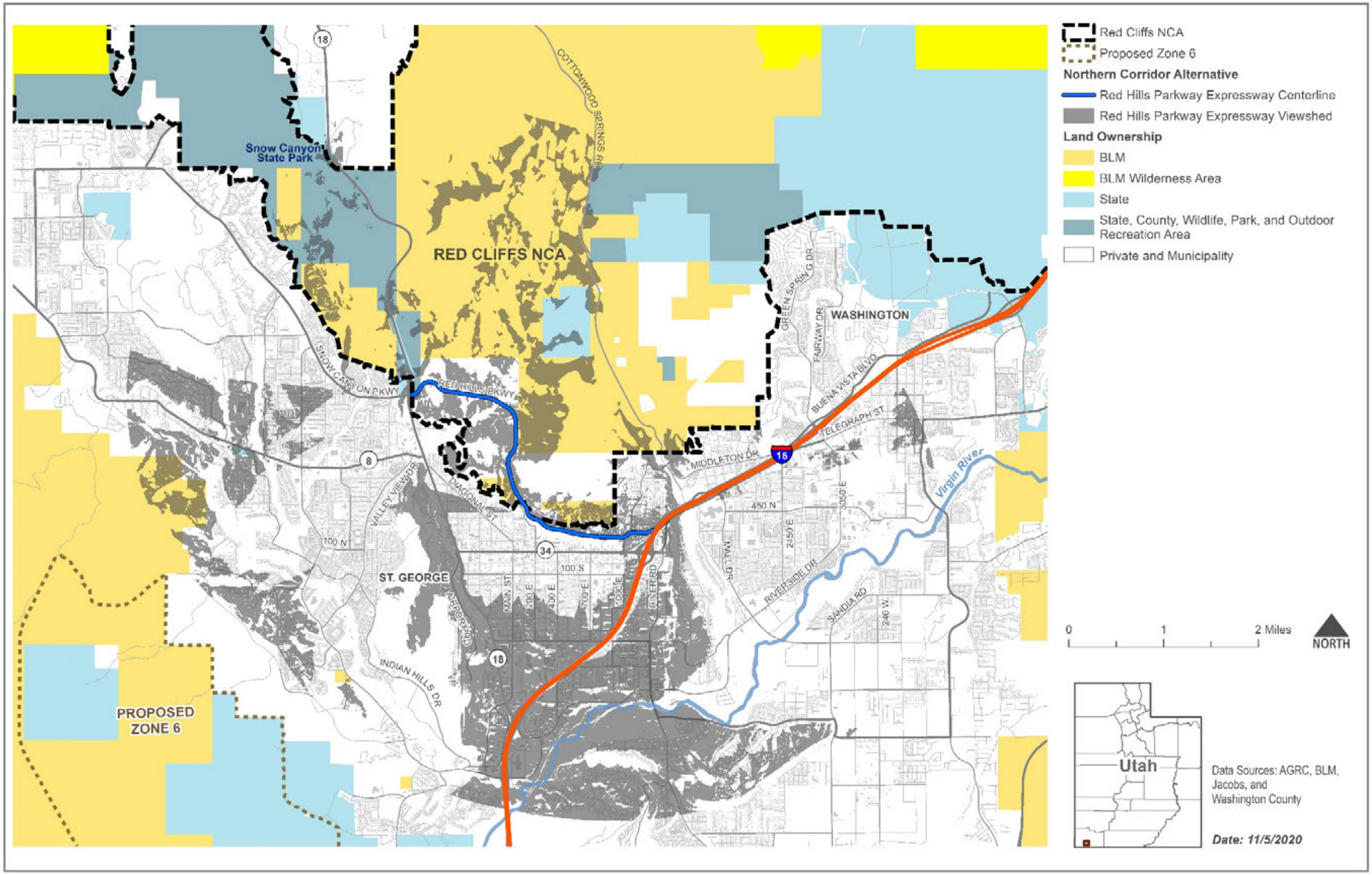
Map 3.13-1b. Visibility Map: UDOT Application Alignment



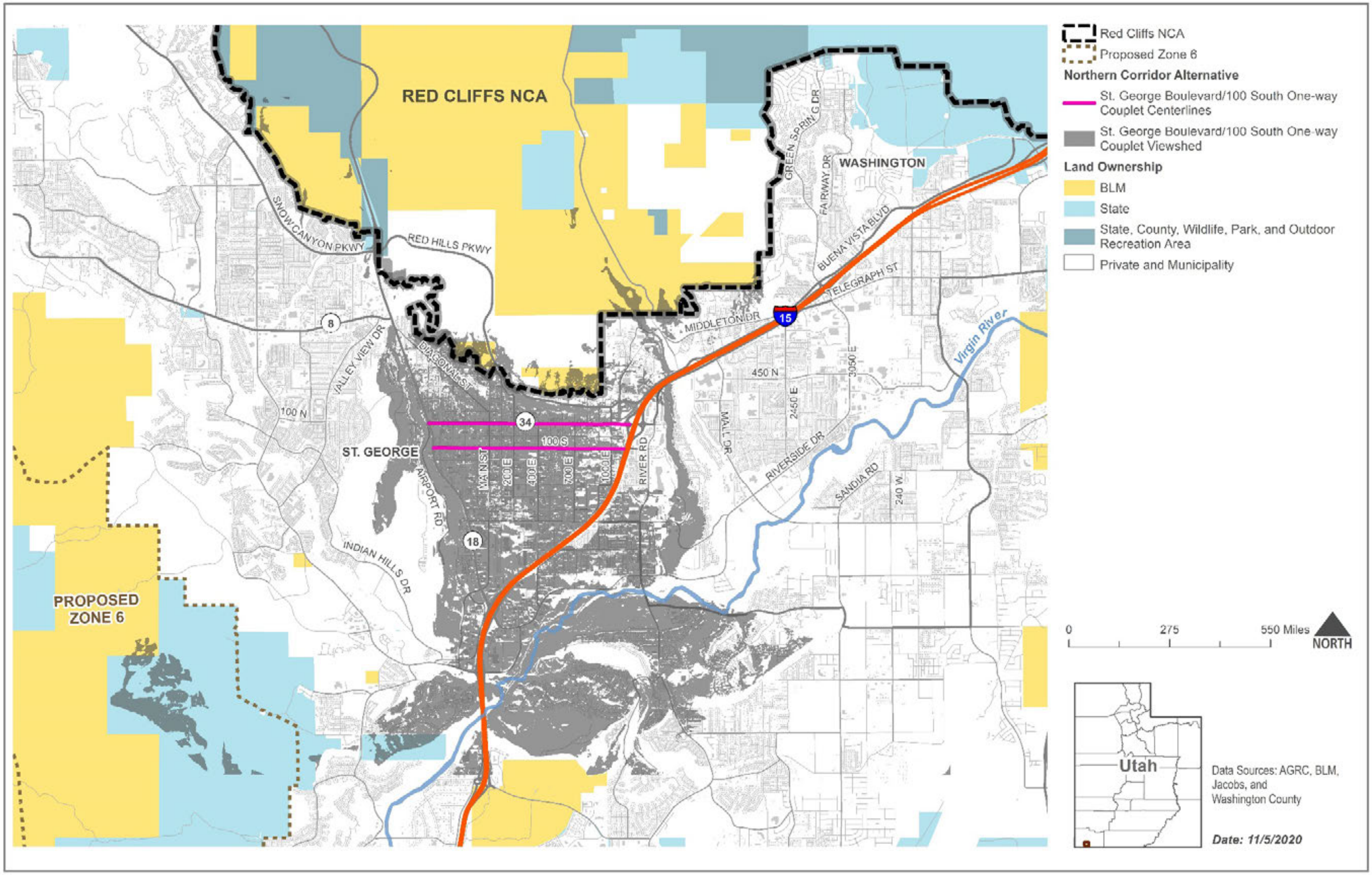
Map 3.13-1c. Visibility Map: Southern Alignment



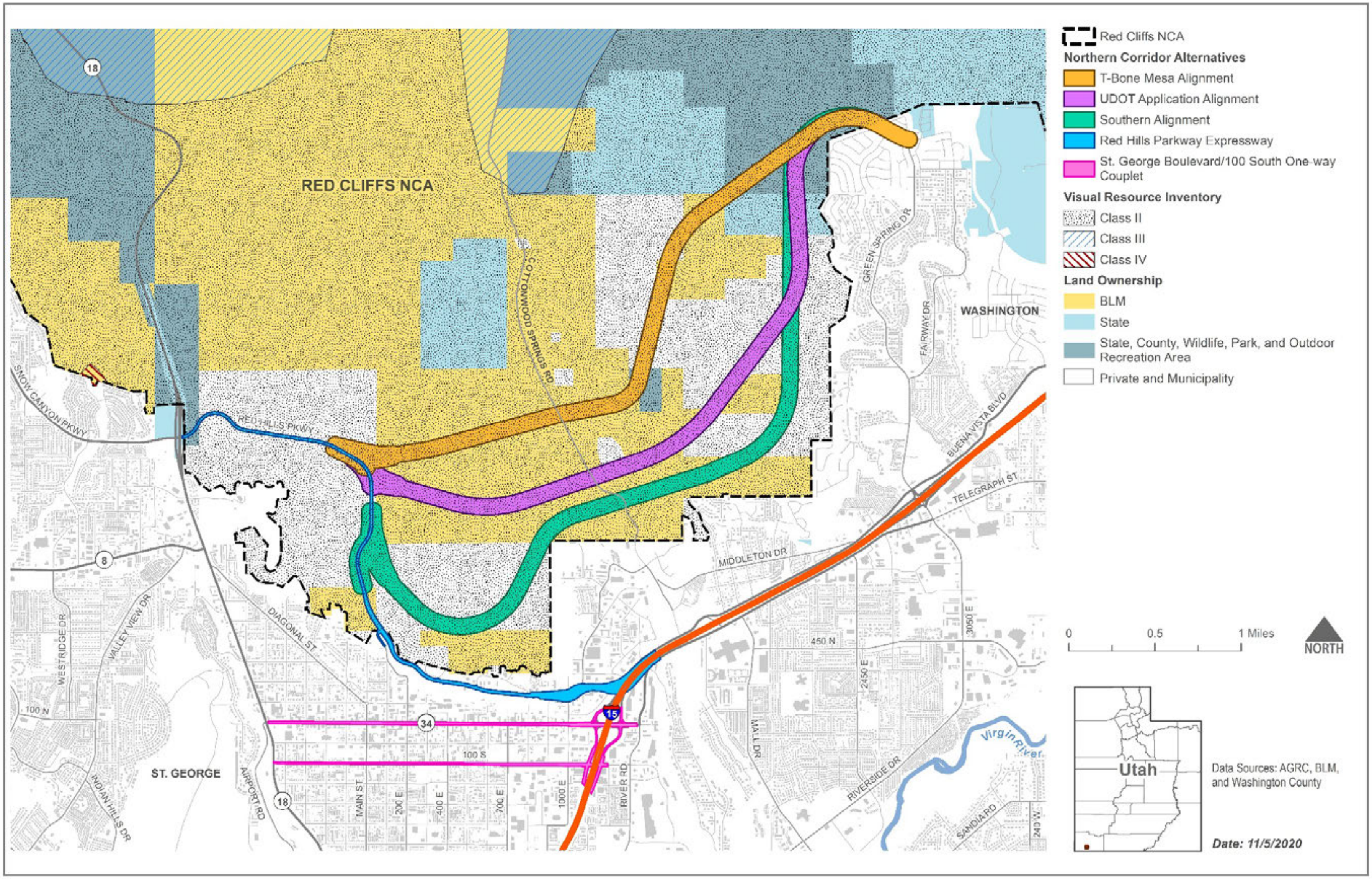
Map 3.13-1d. Visibility Map: Red Hills Parkway Expressway



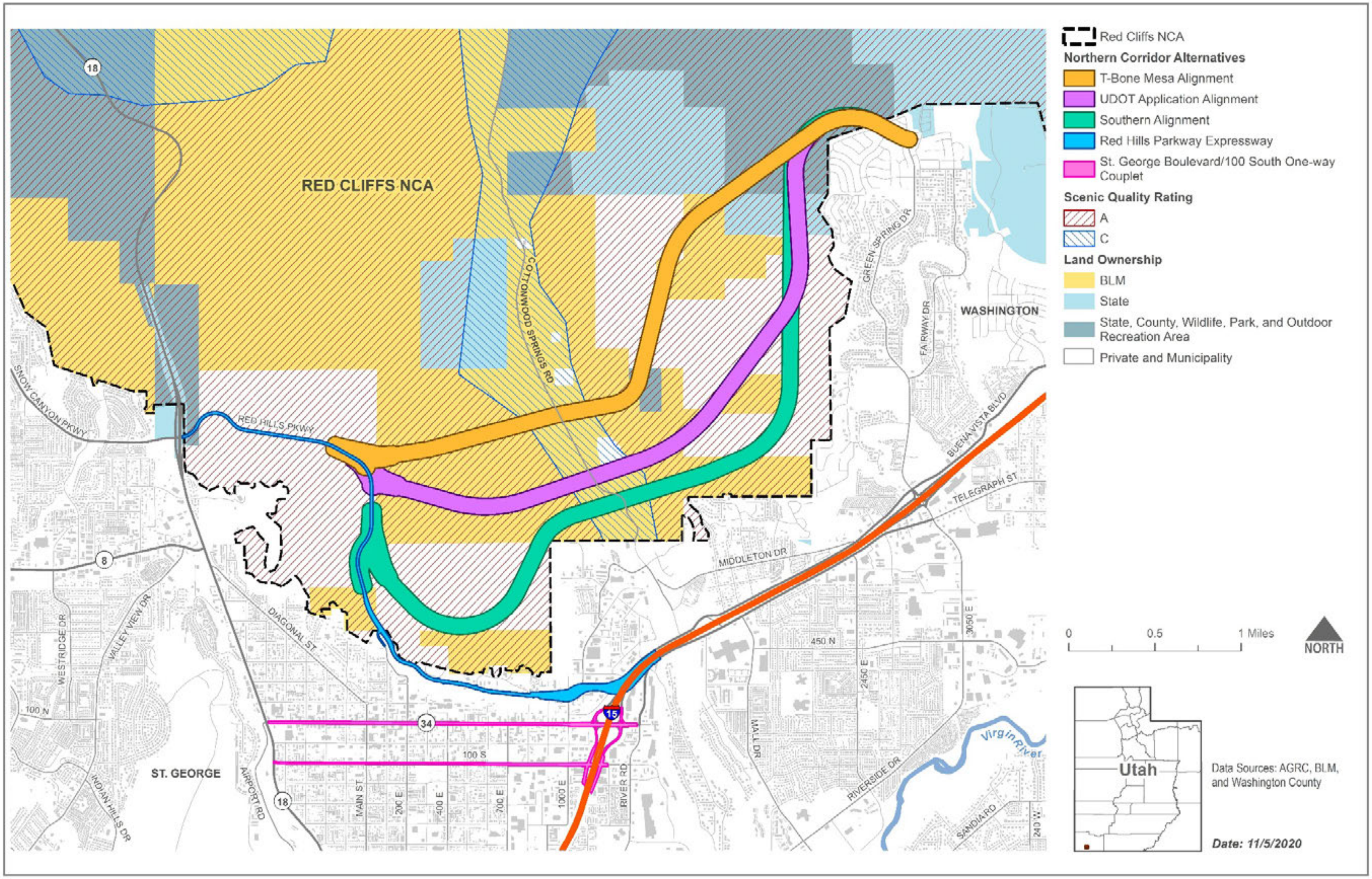
Map 3.13-1e. Visibility Map: St. George Boulevard/100 South One-way Couplet



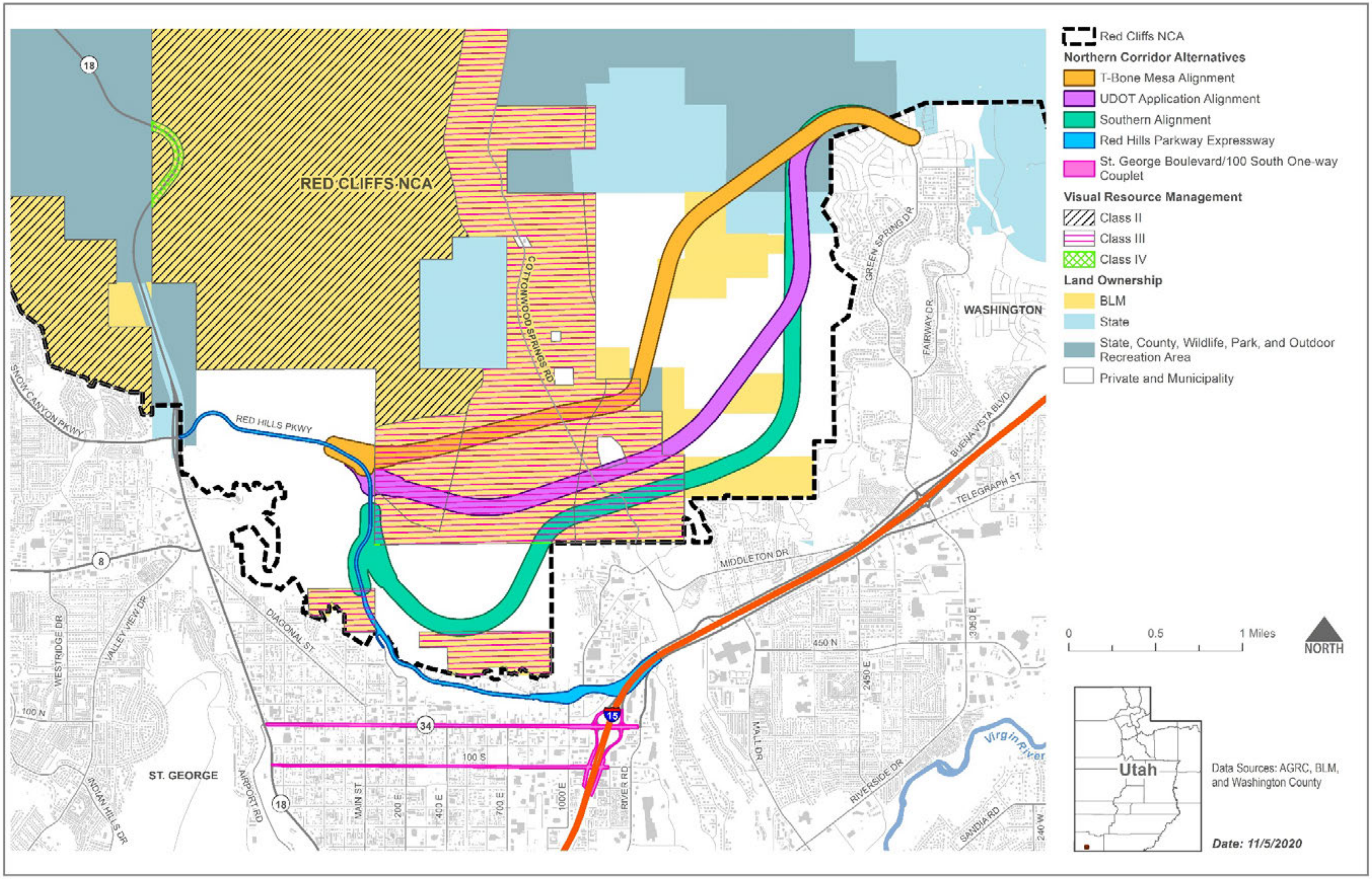
Map 3.13-2. Visual Resource Inventory Classes within the Red Cliffs NCA



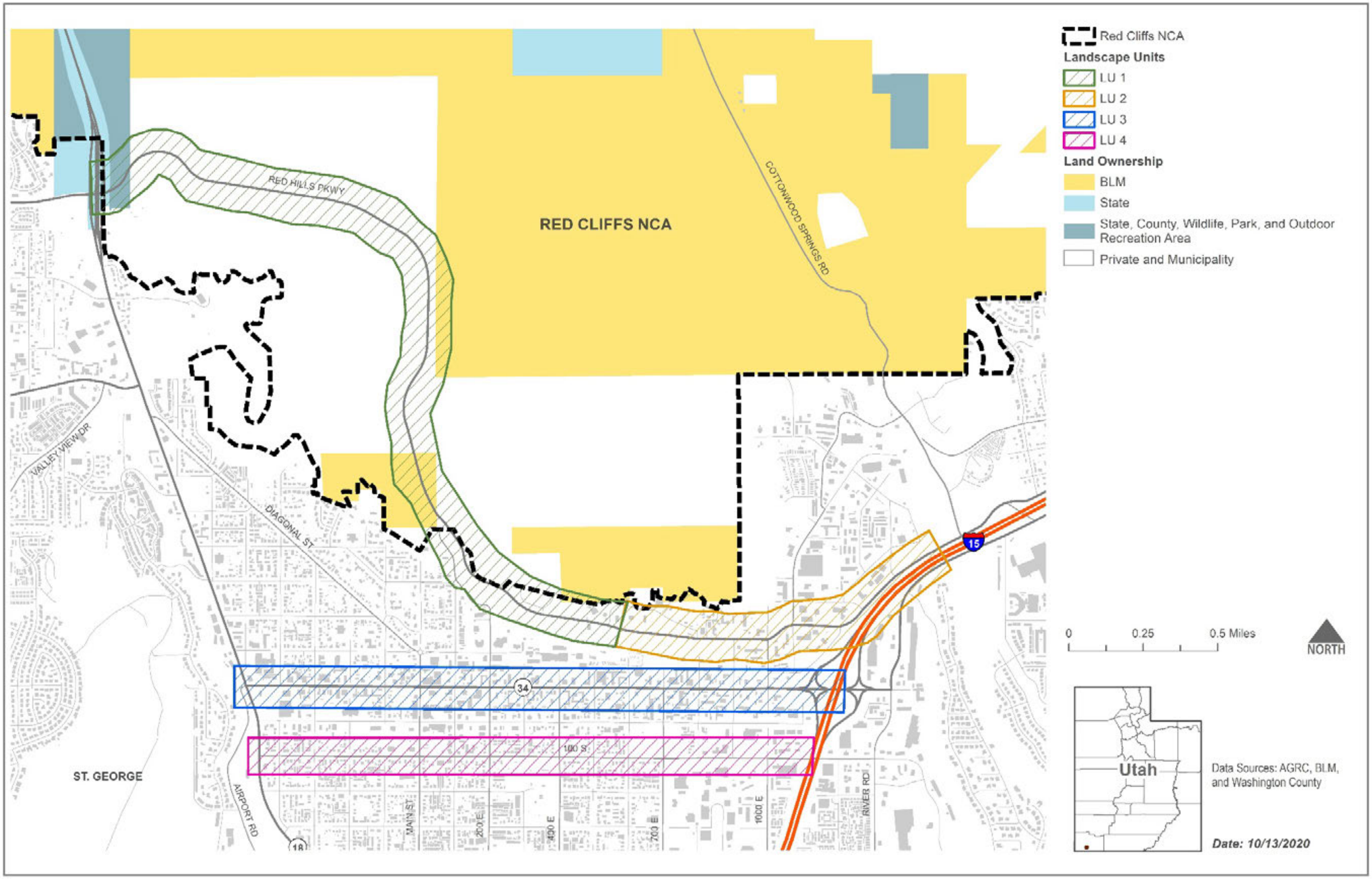
Map 3.13-3. Visual Resource Inventory Scenic Quality within the Red Cliffs NCA



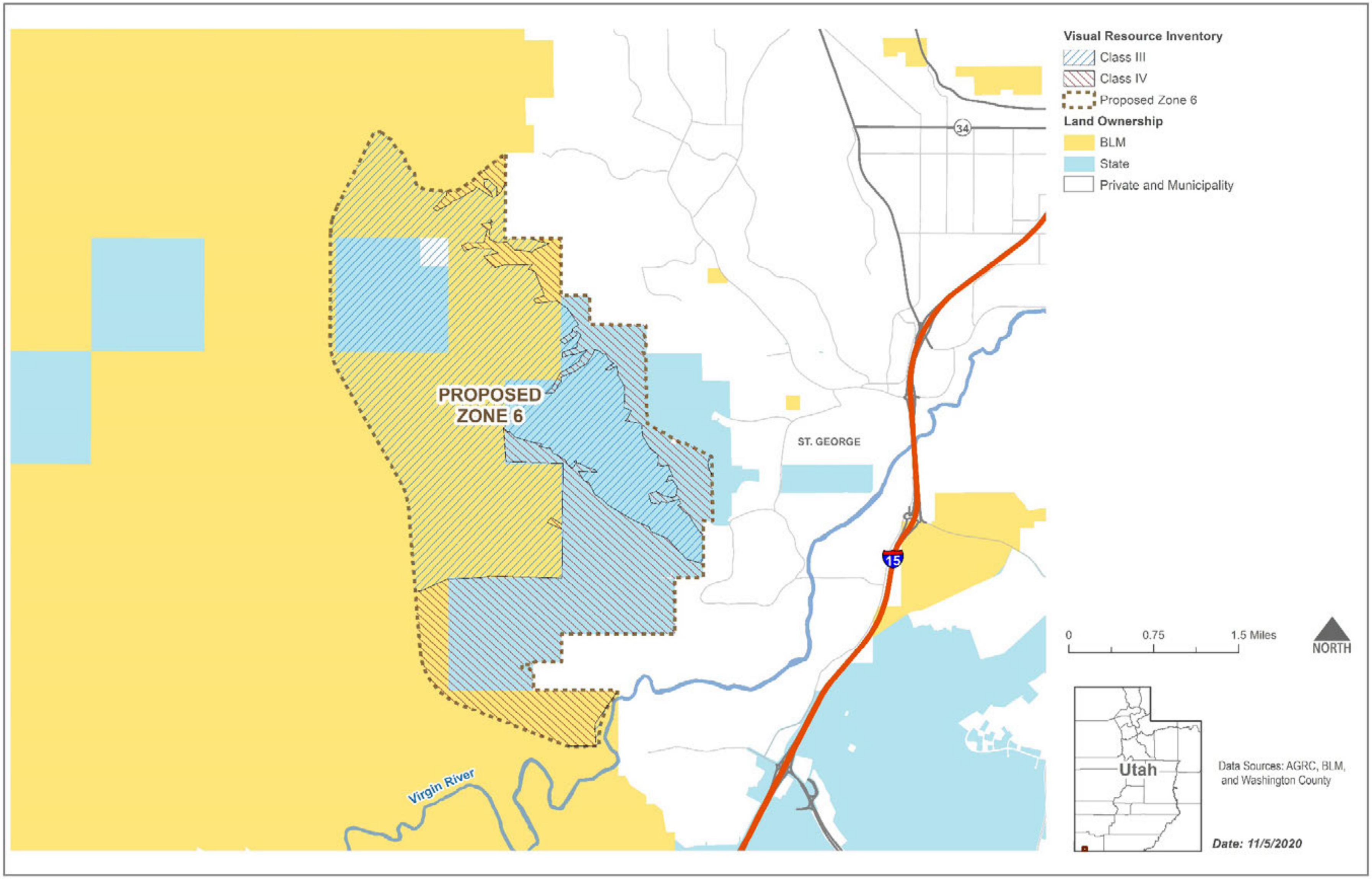
Map 3.13-4. Visual Resource Management Classes within the Red Cliffs NCA



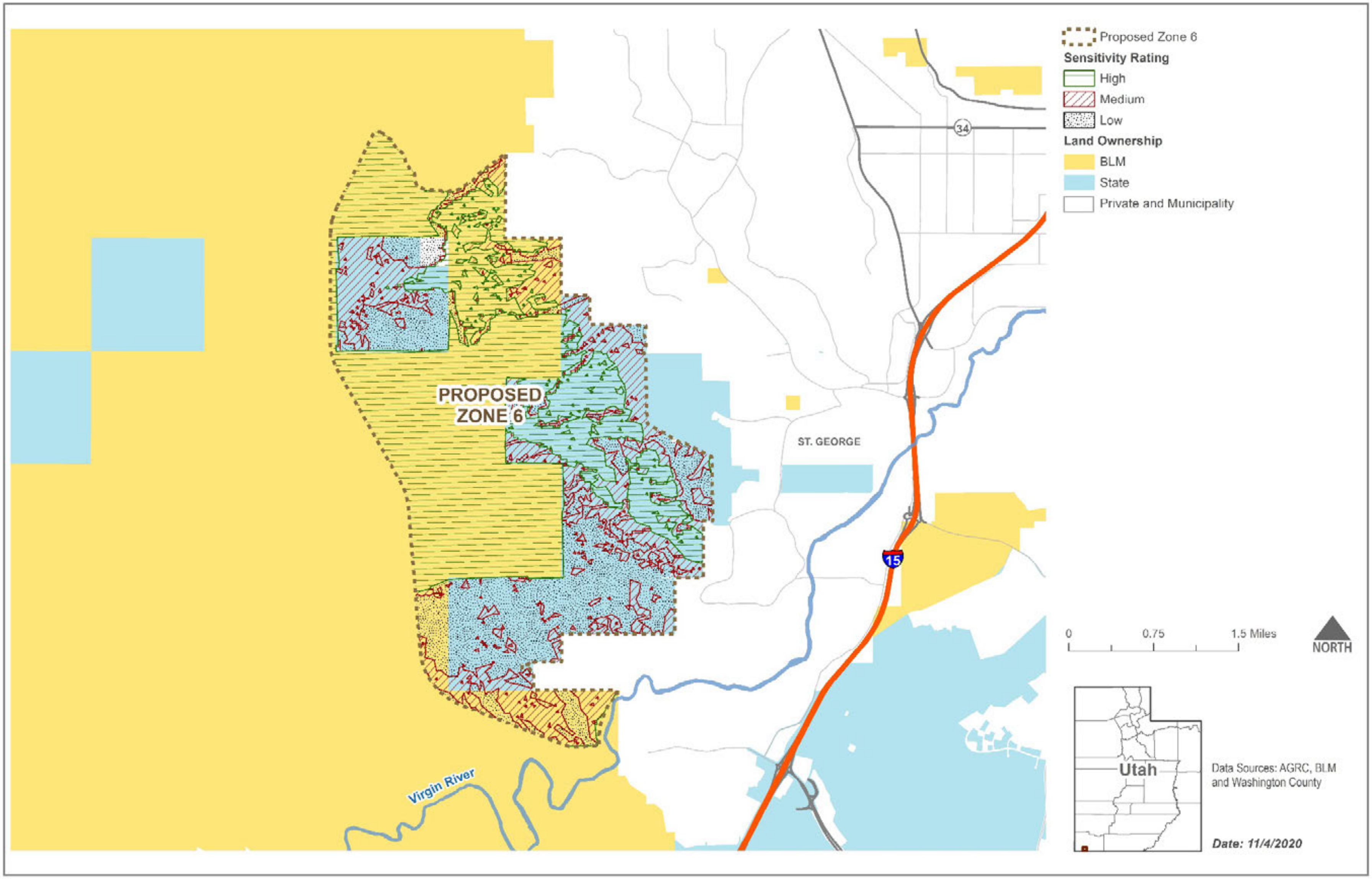
Map 3.13-5. Landscape Units



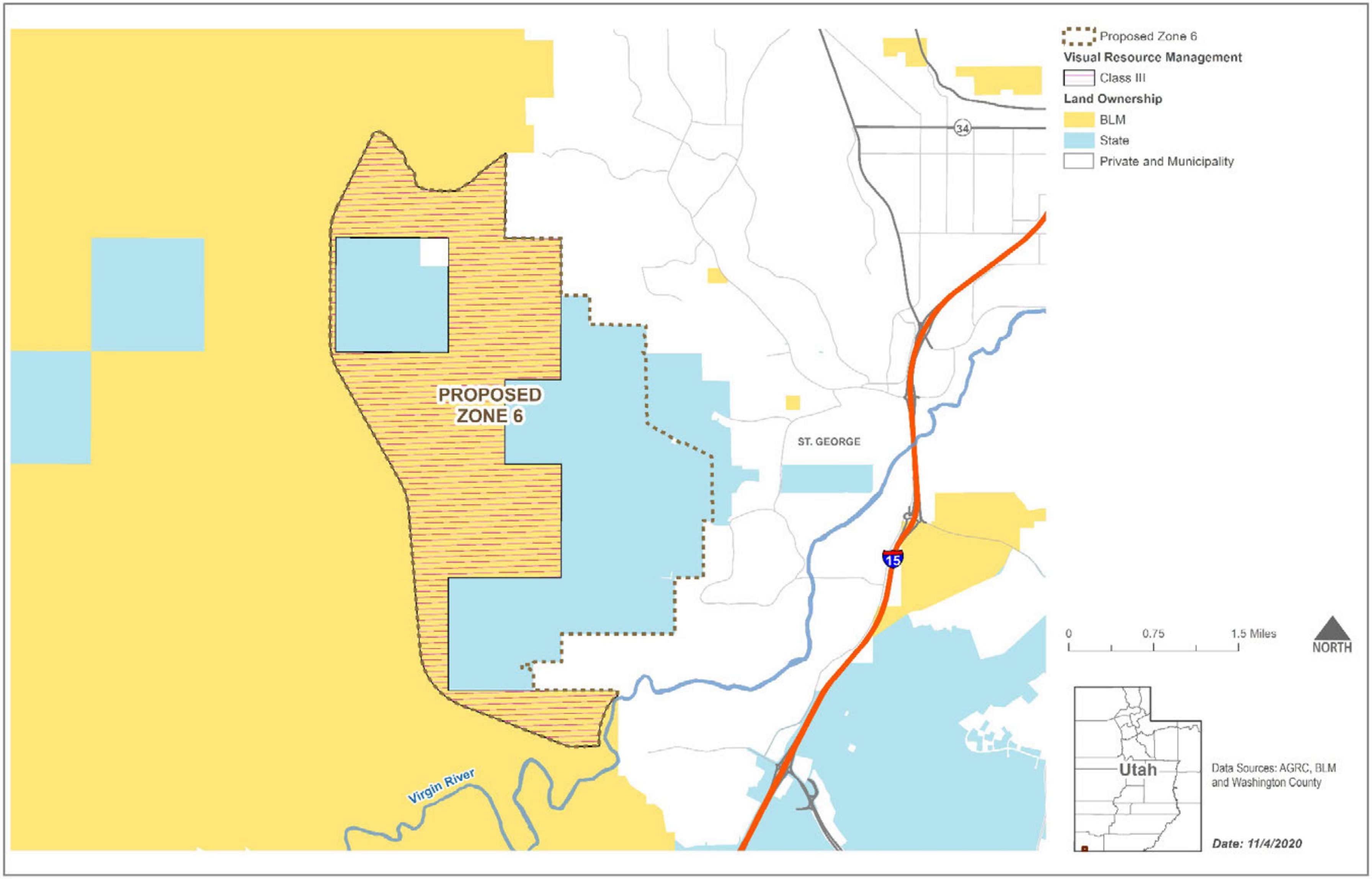
Map 3.13-6. Visual Resource Inventory Classes within Proposed Zone 6



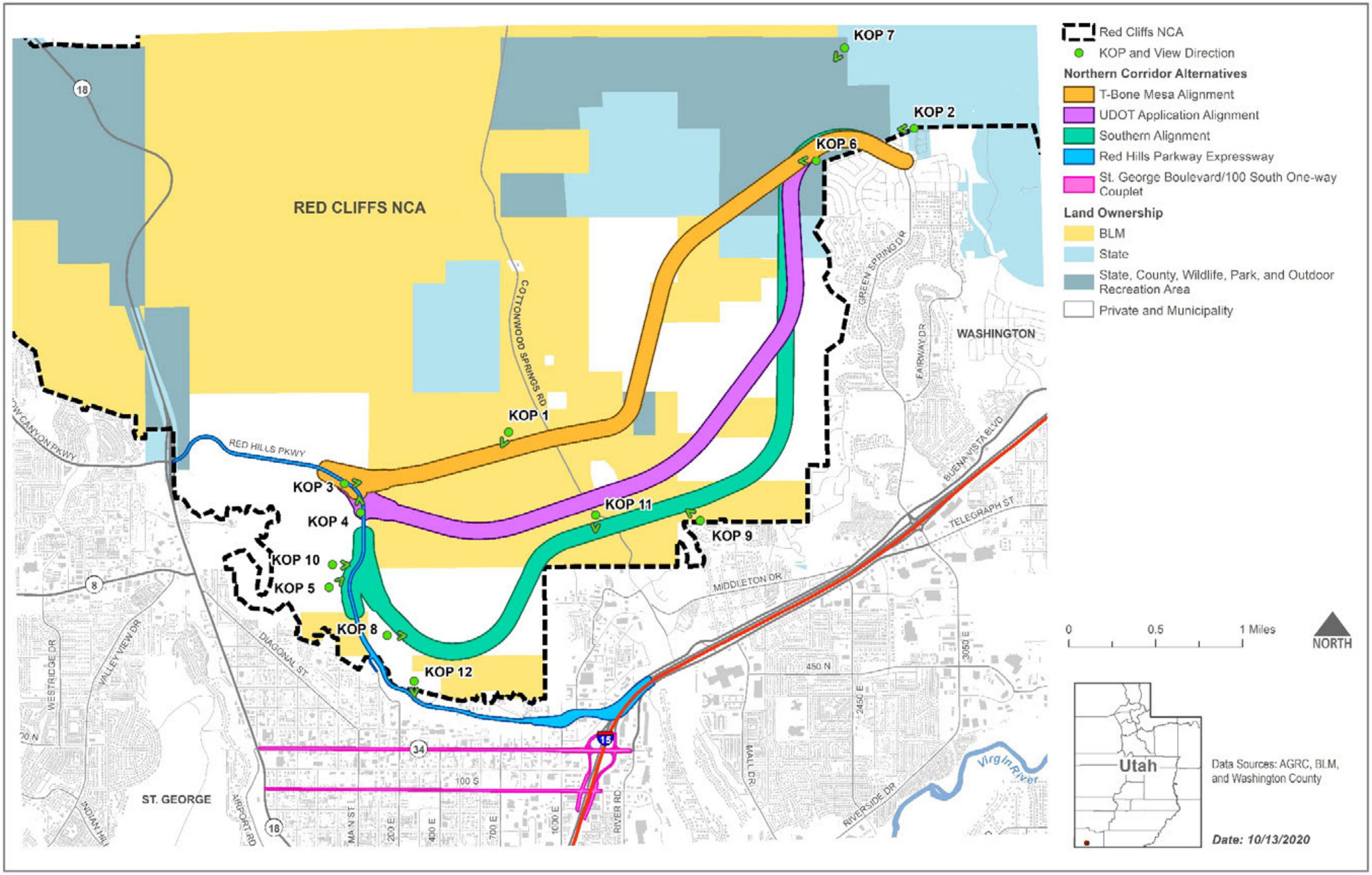
Map 3.13-7. Visual Resource Inventory Sensitivity Ratings within Proposed Zone 6



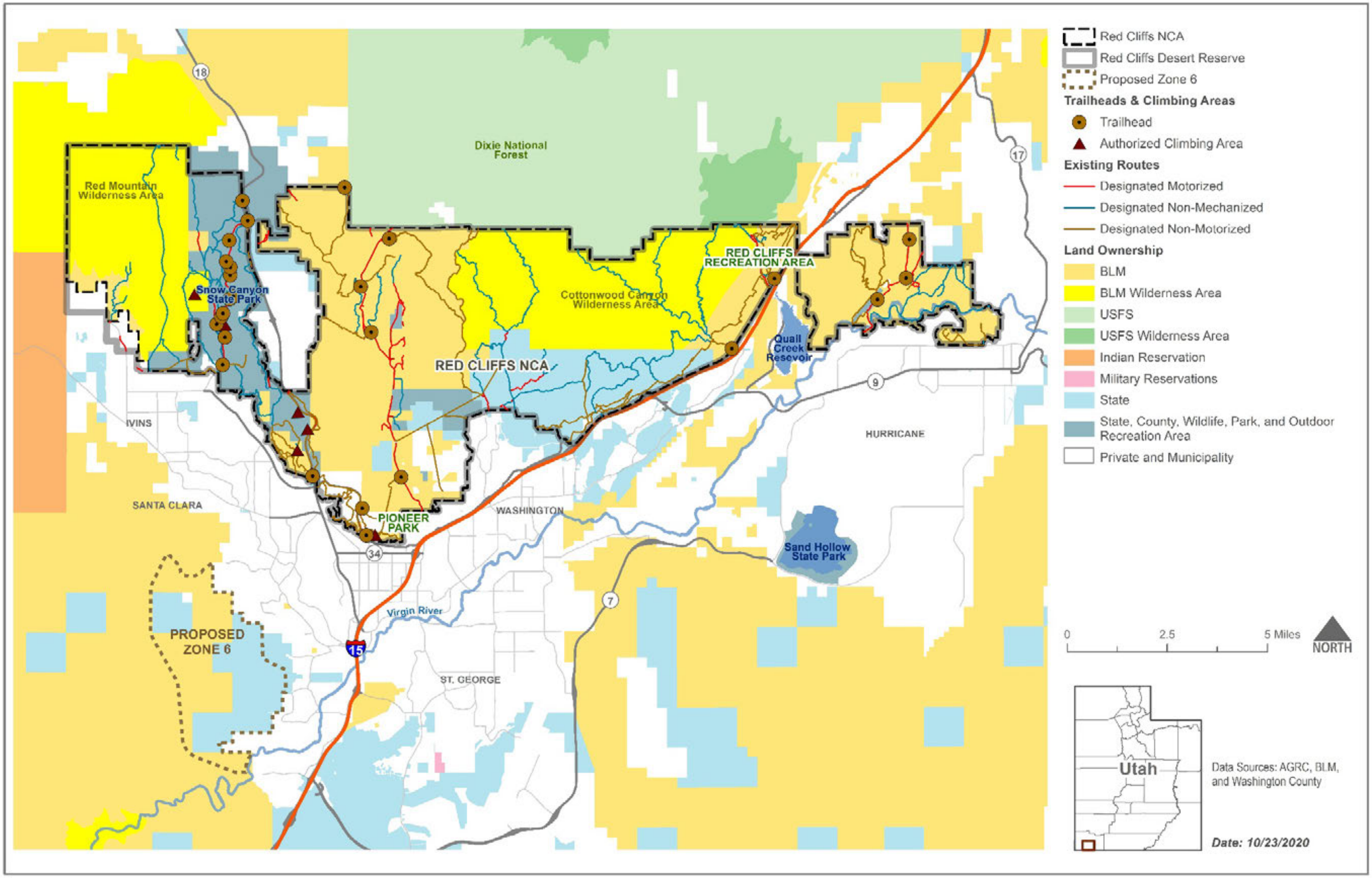
Map 3.13-8. Visual Resource Management Classes within Proposed Zone 6



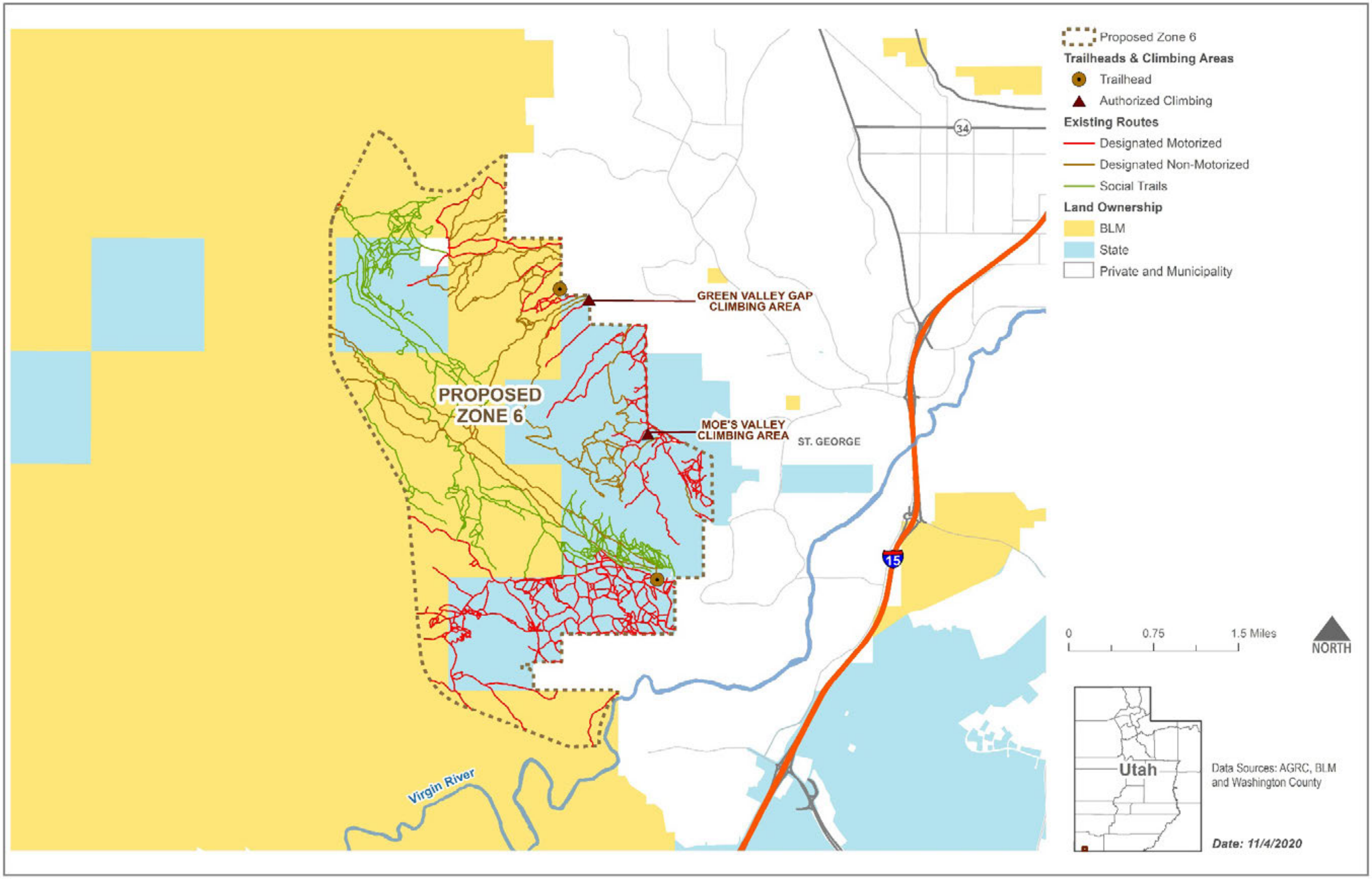
Map 3.13-9. Key Observation Point Locations



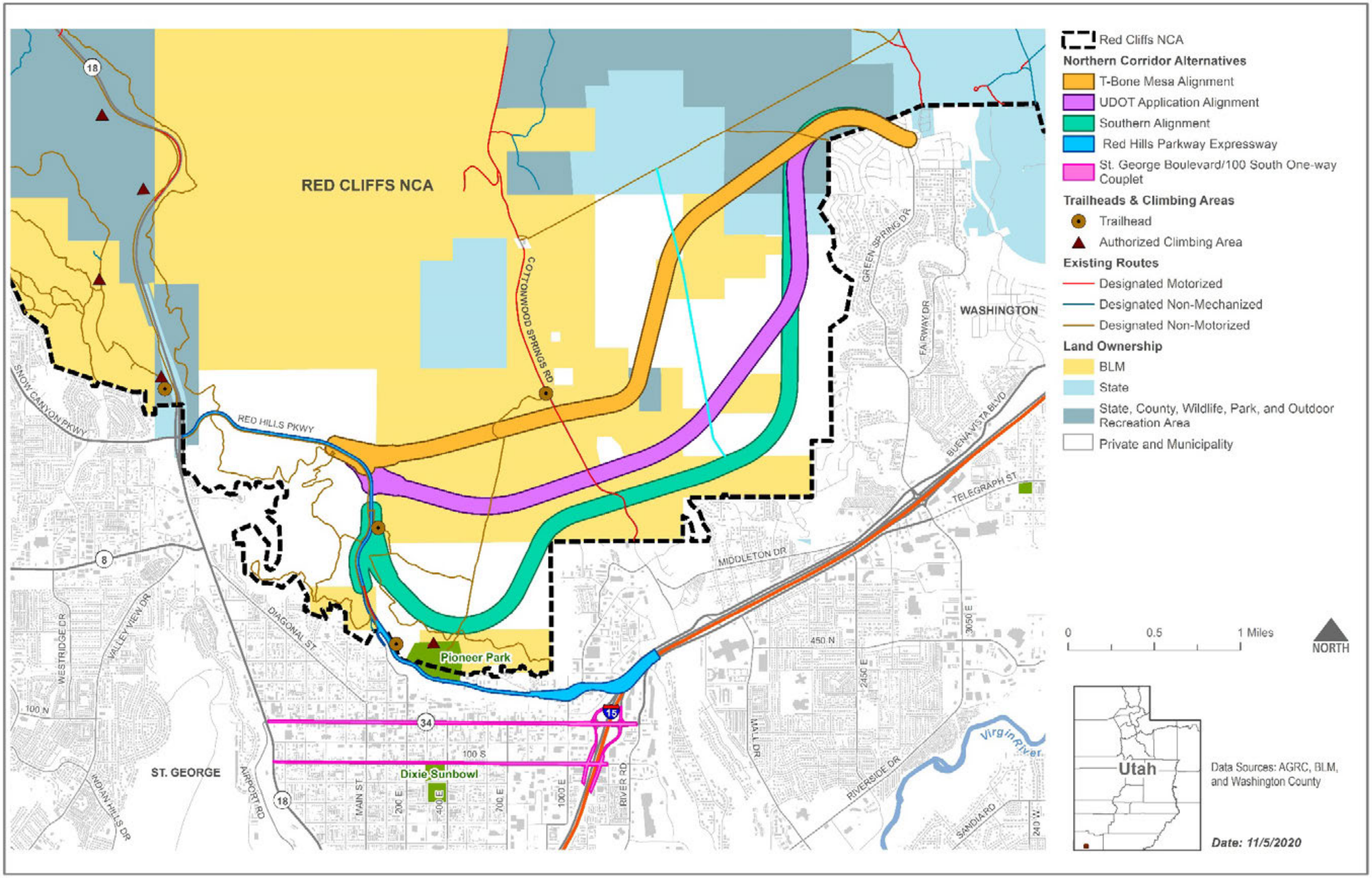
Map 3.15-1. Recreation and Visitor Services within the Red Cliffs NCA



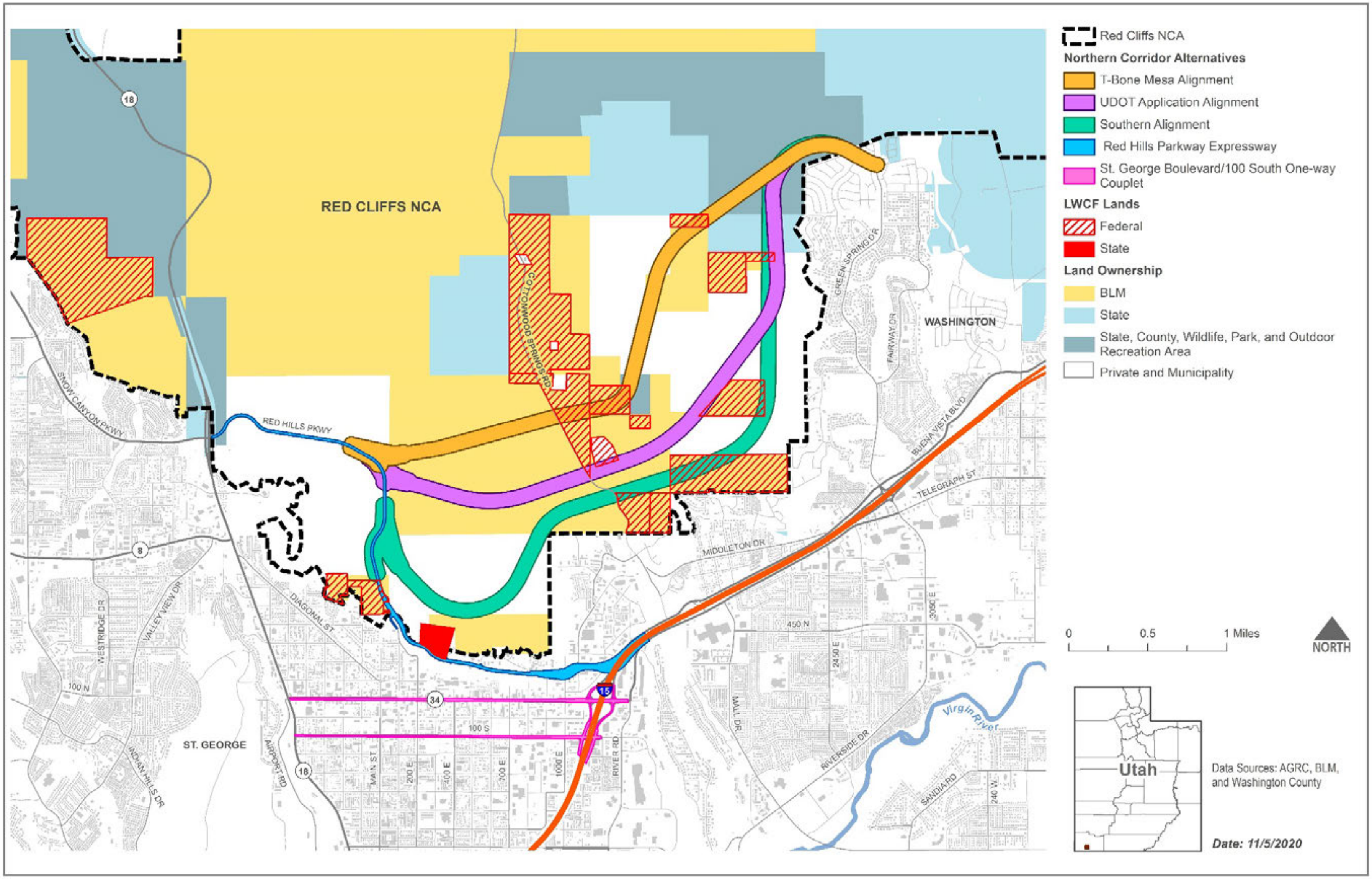
Map 3.15-2. Recreation and Visitor Services within Proposed Zone 6



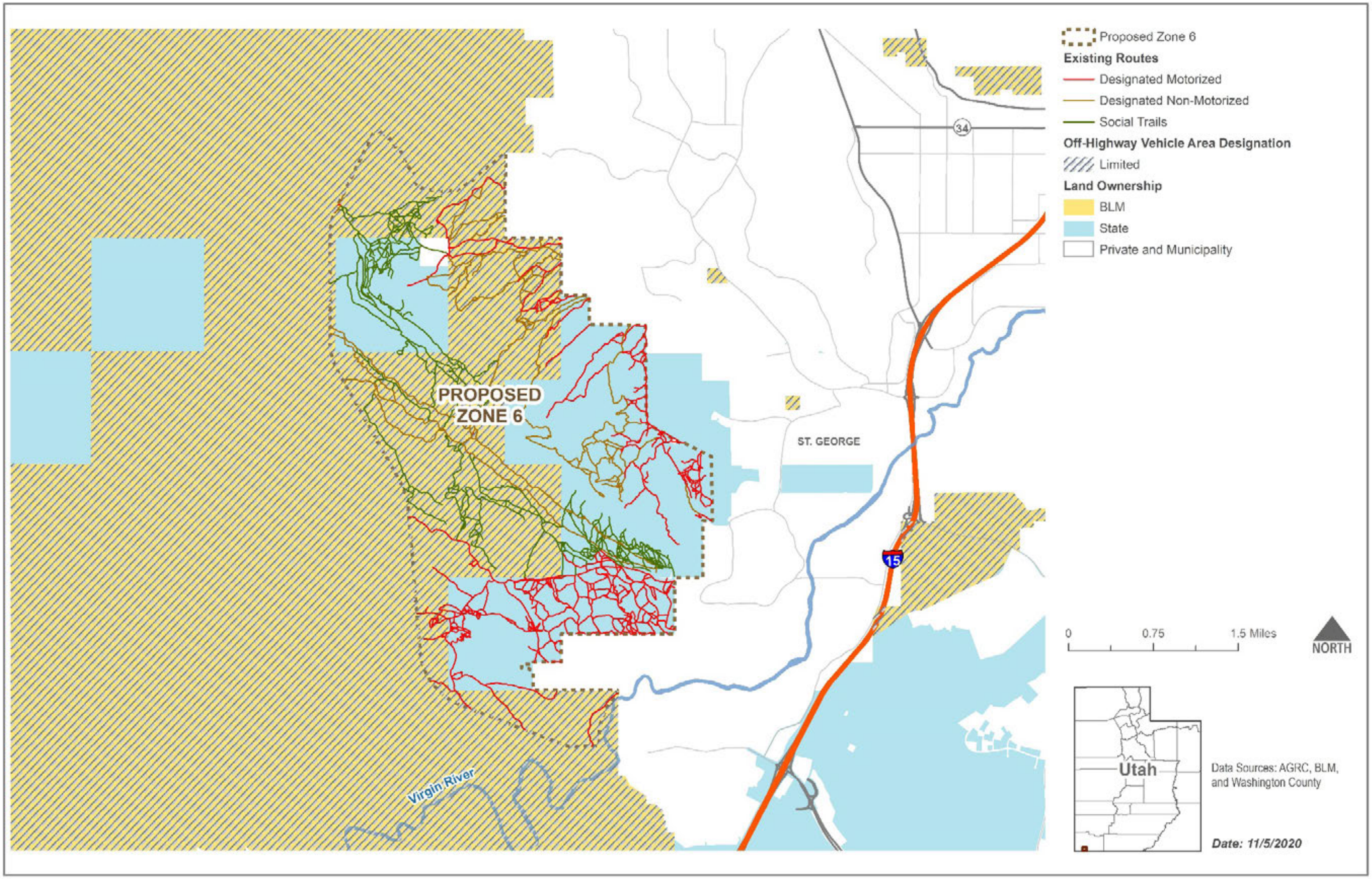
Map 3.15-3. Recreation and Visitor Services Impacted by the Northern Corridor Alternatives



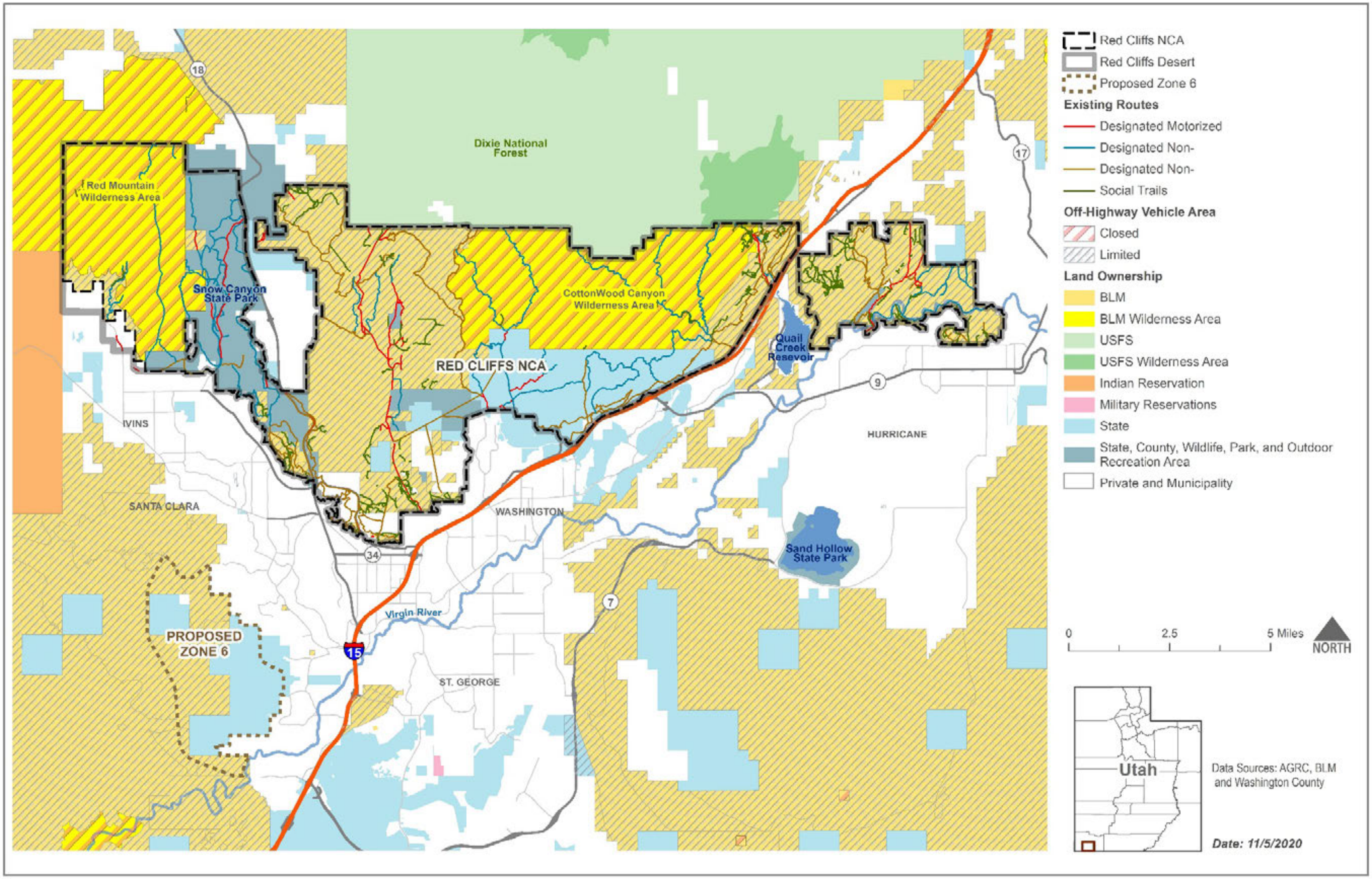
Map 3.16-1. Land and Water Conservation Fund Act Lands within the Red Cliffs NCA and Reserve



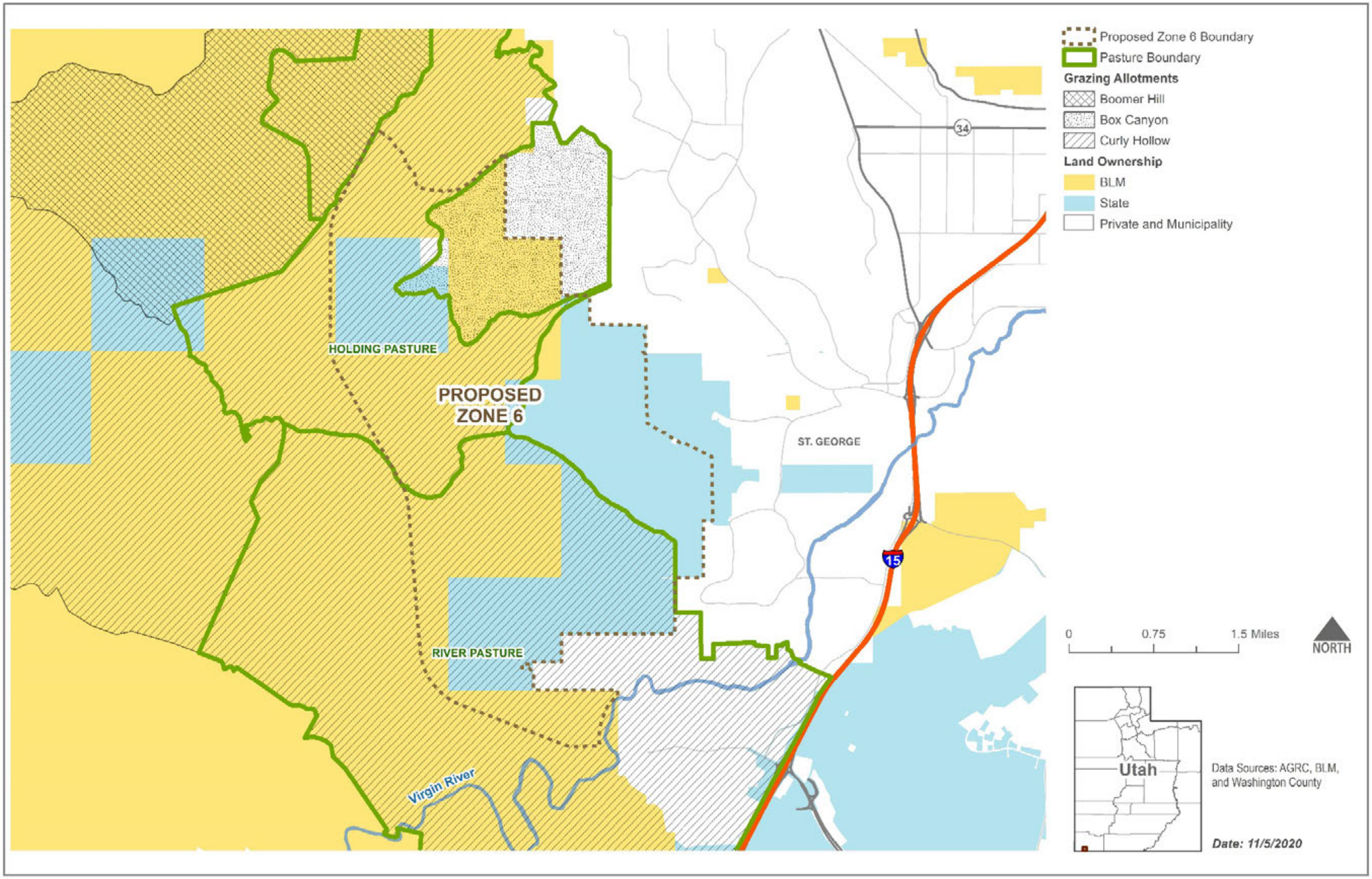
Map 3.17-1. Existing Routes within Proposed Zone 6



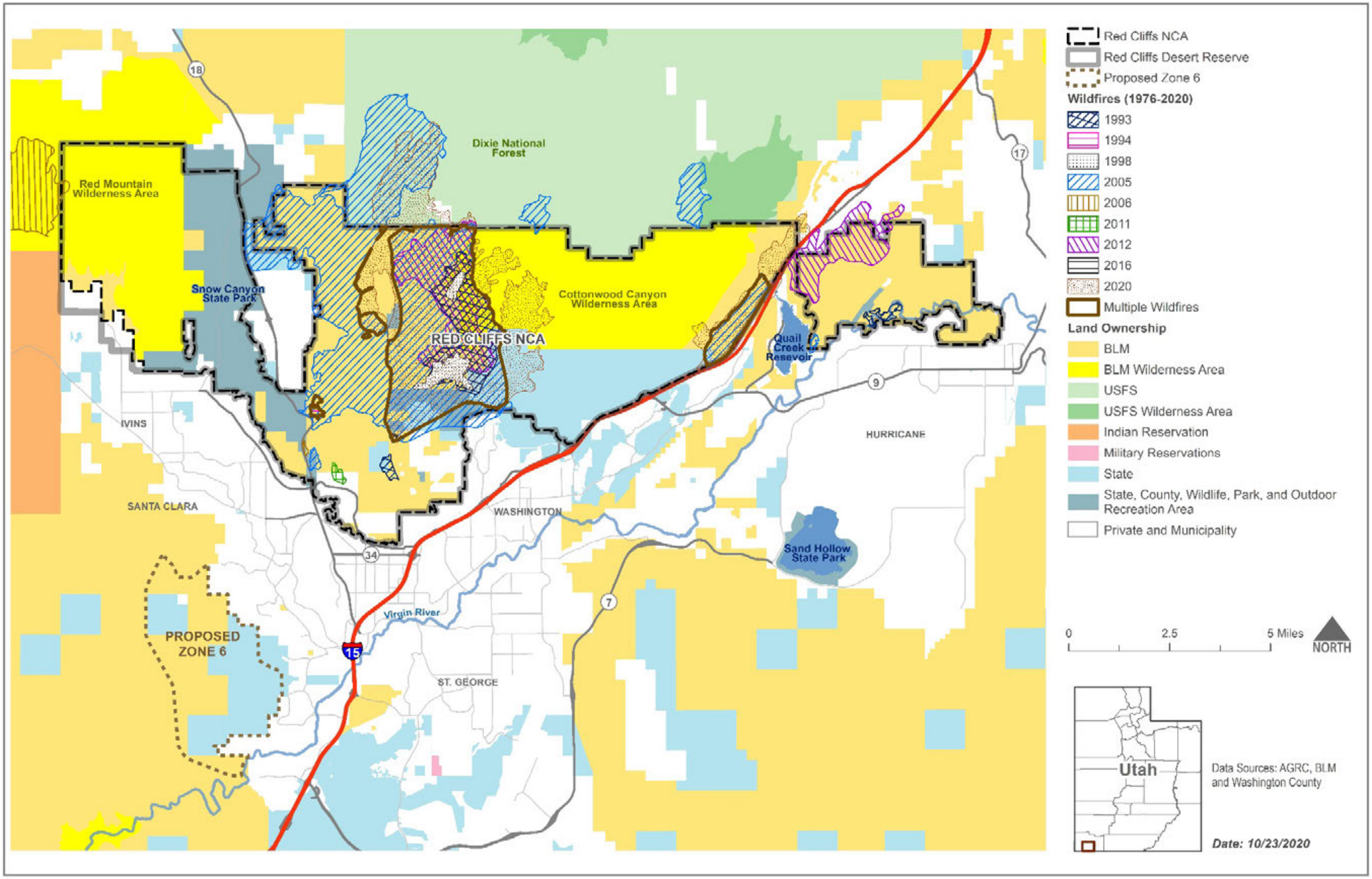
Map 3.17-2. Existing Routes and Off-Highway Vehicle Area Designations within the Red Cliffs NCA



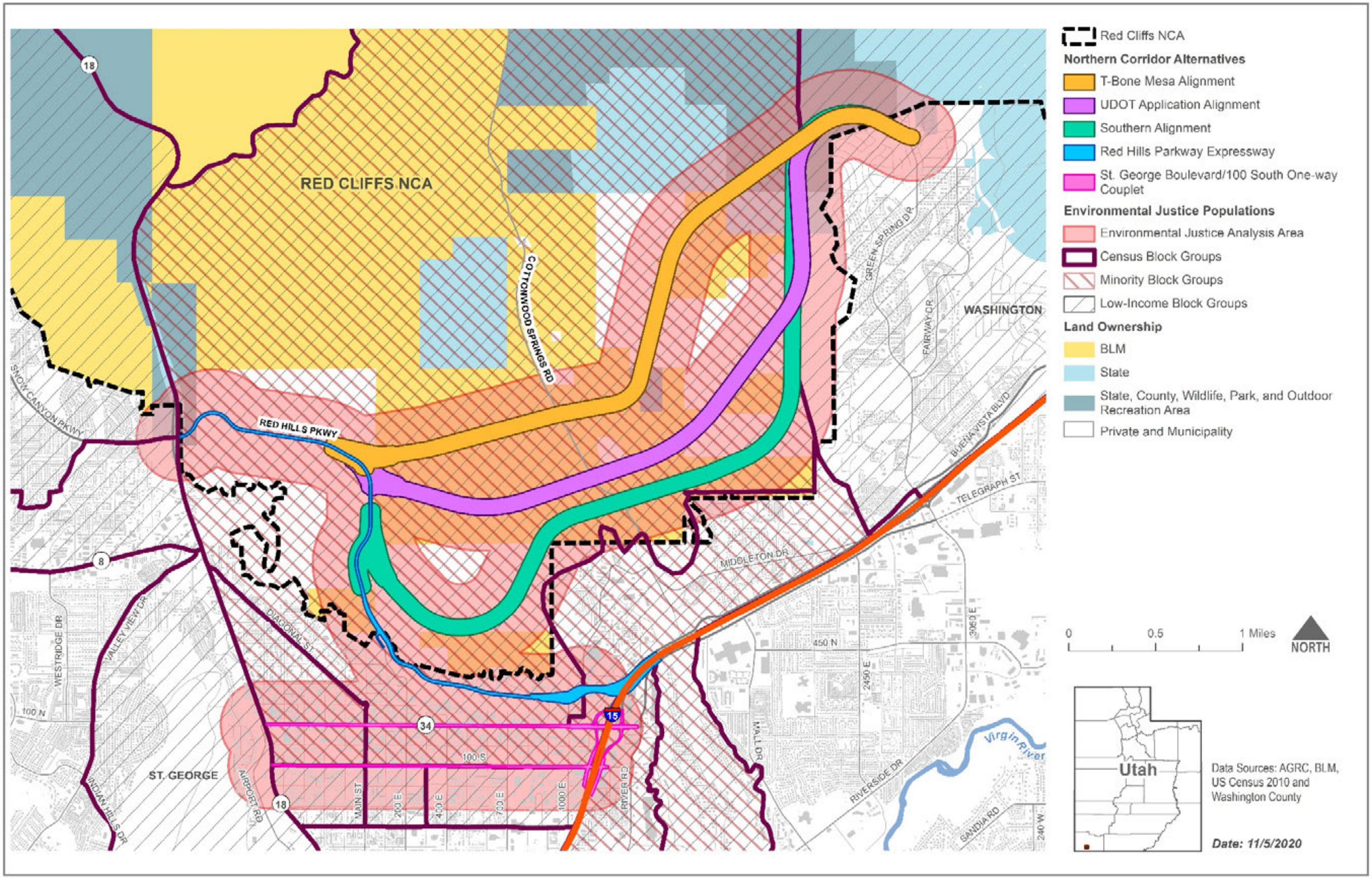
Map 3.21-1. Livestock Grazing within Proposed Zone 6



Map 3.22-1. Fire Occurrence within the Red Cliffs NCA



Map 3.27-1. Environmental Justice Populations



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Appendix C: Laws, Regulations, Policies, and Plans Considered in the Development of the Environmental Impact Statement

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Appendix C. Laws, Regulations, Policies, and Plans Considered in the Development of the Environmental Impact Statement

The Bureau of Land Management (BLM) and the U.S. Fish and Wildlife Service (USFWS) have considered and developed the Environmental Impact Statement and Resource Management Plan amendments to be consistent with applicable laws, regulations, policies, and plans including, but not limited to, those listed in this section.

C.1 Federal Laws

Administrative Procedure Act (Public Law 79–404)

American Indian Religious Freedom Act (42 United States Code [U.S.C.] 1996)

Archaeological Resources Protection Act of 1979 (16 U.S.C. 470aa to 470ee)

Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d)

Clean Air Act of 1970, as amended (42 U.S.C. 7401)

Clean Water Act of 1972 (33 U.S.C. 1251 et seq.)

Data Quality Act (as included in Public Law 106-554)

Endangered Species Act (ESA) (16 U.S.C. 1531 to 1544), as amended

Farmland Protection Policy Act (7 Code of Federal Regulations [CFR] 657.5)

Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701), as amended

Federal Noxious Weed Act of 1974 (7 U.S.C. 2801 and 7 U.S.C. 2814)

Fish and Wildlife Act of 1956 (16 U.S.C. 724a et seq.), as amended

Fish and Wildlife Conservation Act of 1980 (16 U.S.C. 2901-2911)

Fish and Wildlife Coordination Act of 1934 (16 U.S.C. 661-667)

John D. Dingell Jr. Conservation, Management, and Recreation Act (PL 116-9)

Land and Water Conservation Fund Act (54 U.S.C. 200301 et seq.)

Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712)

National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321-4347), as amended

National Historic Preservation Act of 1966 (54 U.S.C. 300101-307108), as amended

Omnibus Public Land Management Act of 2009 (Public Law 111-11)

Paleontological Resources Preservation Act of 2009 (16 U.S.C. 470)

Resource Conservation and Recovery Act of 1976 (42 U.S.C. 6901 et seq.)

Taylor Grazing Act of 1934 (Public Law 73–482)

C.2 Federal Regulations

BLM Resource Regulations (generally 43 CFR Chapter II)

BLM Leases, Permits, and Easements Regulations (43 CFR 2920)

BLM Off-Road Vehicle Regulations (43 CFR 8340)

BLM Planning Regulations (43 CFR 1600)

BLM Rights-of-Way Regulations (43 CFR 2800 and 2880)

BLM Grazing Permits and Leases (43 CFR 4130.2)

BLM Recreation Programs (43 CFR 8340.0-5, 8342.1(a-d))

Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500)

Endangered Species Act Endangered and Threatened Wildlife and Plants (50 CFR 17.22 (b))

Federal Highway Administration Procedures for Abatement of Highway Traffic Noise and Construction Noise (23 CFR 772)

National Register of Historic Places of 1966 (36 CFR 60-63)

Protection of Historic Properties (36 CFR 800)

U.S. Department of the Interior NEPA Regulations (43 CFR 46)

U.S. Environmental Protection Agency National Primary and Secondary Ambient Air Quality Standards (40 CFR 50)

USFWS General Permit Procedures (50 CFR 13)

USFWS Endangered Species Act regulations (50 CFR 17)

USFWS Permits for Incidental Taking of Species (50 CFR 222.307)

USFWS Habitat Conservation Plan Assurances “No Surprises” Rule (63 Federal Register 8859)

C.3 Federal Policies

BLM Compensatory Mitigation Policy (Instruction Memorandum [IM] 2019-018)

BLM Federal Wildland Fire Management Policy (IIM 2009-112)

BLM Guidance for Implementation of the New Travel Management Area and Plans Data Standard (IM 2018-102)

BLM Handbook H-1601-1, Land Use Planning

BLM Handbook H-1780-1, Improving and Sustaining BLM-Tribal Relations

BLM Handbook H-1790-1, NEPA Handbook

BLM Handbook H-8270-1, General Procedural Guidance for Paleontological Resource Management

BLM Handbook H-8320-1, Planning for Recreation and Visitor Services

BLM Handbook H-8342, Travel and Transportation Handbook

BLM Handbook H-8431-1, Visual Resource Contrast Rating

BLM Manual 1601, Land Use Planning

BLM Manual 1613, Areas of Critical Environmental Concern

BLM Manual 1626, Travel and Transportation Management Manual

BLM Manual 1780, Tribal Relations

BLM Manual 4100, Grazing Administration

BLM Manual 6100, National Landscape Conservation System Management

BLM Manual 6220, National Monuments, National Conservation Areas, and Similar Designations

BLM Manual 6500, Wildlife and Fisheries Management

BLM Manual 6840, Special Status Species Management

BLM Manual 7240, Water Quality Manual

BLM Manual 7300, Air Resource Management

BLM Manual 8110, Identifying and Evaluating Cultural Resources

BLM Manual 8140, Protecting Cultural Resources

BLM Manual 8400, Visual Resource Management

BLM Manual 8431, Visual Resource Contrast Rating

Council on Environmental Quality Handbook Considering Cumulative Effects Under NEPA

Executive Order 11988, Floodplain Management

Executive Order 11990, Protection of Wetlands

Executive Order 12898, Federal Actions to Address Environmental Justice to Minority Populations and Low-Income Populations

Executive Order 13084, Consultation and Coordination with Indian Tribal Governments

Executive Order 13112, Preventing the Introduction and Spread of Invasive Species, as amended by Executive Order 13751, Safeguarding the Nation from the Impacts of Invasive Species

Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds

Federal Highway Administration Guidelines for the Visual Impact Assessment of Highway Projects (2015)

National Park Service Land and Water Conservation Fund State Assistance Program Federal Financial Assistance Manual (2008)

Secretarial Order 3355, Streamlining National Environmental Policy Act Reviews and Implementation of Executive Order 13807, "Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects"

Secretarial Order 3366, Increasing Recreational Opportunities on Lands and Waters Managed by the U.S. Department of the Interior

Secretarial Order 3372, Reducing Wildfire Risks on Department of the Interior Land Through Active Management

Secretarial Order 3373, Evaluating Public Access in Bureau of Land Management Public Land Disposals and Exchanges

State Protocol Agreement Between the Bureau of Land Management Utah and the Utah State Historic Preservation Office Regarding the Manner in which the Bureau of Land Management will meet its Responsibilities Under the National Historic Preservation Act as Provided for in the National Programmatic Agreement (2020)

USFWS Habitat Conservation Planning and Incidental Take Permit Processing Handbook

C.4 State and Local Policies and Plans

City of St. George General Plan (2002)

City of Santa Clara 2010-2035 General Plan (2010)

City of Hurricane General Plan (2011)

Dixie Metropolitan Planning Organization's 2019-2050 Regional Transportation Plan

General Plan of Washington County (2012)

Ivins City General Plan (2015)

Red Cliffs Desert Reserve Public Use Plan (2000)

St. George City Code (Title 4, Chapter 9)

State of Utah Resource Management Plan (2018)

Utah Department of Transportation (UDOT) Noise Abatement Policy (08A2-01)

UDOT 2017 Standard Specification for Road and Bridge Construction (Section 01355, Sub-Section 3.6)

UDOT Standard Specifications and Standard Drawing Books (2017)

UDOT Long Range Transportation Plan (2015-2040)

UDOT State Transportation Improvement Program (2019)

Utah Administrative Code (R307-205)

Utah Pollutant Discharge Elimination System, UAC R317-8

Utah Strategic Plan for Managing Noxious and Invasive Weeds (2004)

Utah Wildlife Action Plan (2015)

Utah's Nonpoint Source Pollution Management Plan (2000)

Utah's State Comprehensive Outdoor Recreation Plan (2014)

Washington City General Plan (2017)

Washington County Vision Dixie (2006)

Appendix D: Design Features of the Proposed Action and Mitigation Measures and Conditions of Approval

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Appendix D. Design Features of the Proposed Action and Mitigation Measures and Conditions of Approval

As described in Section 2.2.9, the Bureau of Land Management (BLM) requires the application of avoidance, minimization, and mitigation measures to reduce impacts associated with the Northern Corridor Project. These measures would be applied as either design features of the proposed action for environmental protection or mitigation measures and conditions of approval.

D.1 Design Features of the Proposed Action for Environmental Protection

The design features of the proposed action for environmental protection, or design features, were developed based on the Plan of Development (POD) submitted by the applicant and the best management practices included in the BLM Red Cliffs National Conservation Area (NCA) Resource Management Plan (RMP). Table D-1 includes a summary description of each design feature and the details of the design feature components from the applicant's POD and the Red Cliffs NCA RMP.

Table D-1. Design Features of the Project for Environmental Protection

Design Feature	UDOT Construction Specification (UDOT 2017)	Applicability
In consultation with appropriate land-management agencies and the State Historic Preservation Officers and in accordance with the Programmatic Agreement (to comply with Section 106 of the National Historic Preservation Act), develop specific mitigation measures for cultural resources.	Not applicable	Construction, Operations and Maintenance
1. Obtain authorization before starting any ground-disturbing activity not previously cleared by the department, such as wasting project-generated material; excavating borrow material; and locating equipment, storage areas, office sites, utility lines, or holding ponds. 2. Cultural and paleontological. Perform and provide a cultural survey as determined by the engineer to verify no cultural or paleontological resources are affected by the activity.	01355 Environmental Compliance Part 3.7 Environmental Clearance by the Contractor	Construction
1. Suspend work within the vicinity if historical, archaeological, or paleontological objects, features, sites, or human remains are discovered during construction: a) Provide a 100-feet minimum buffer around the perimeter of the discovery. b) Protect the discovery area. c) Contact the engineer, and send notice of the nature and exact location of the discovery. d) Provide written documentation to the engineer within 2 calendar days of discovery. 2. Do not recommence work within the area of discovery until the engineer provides notice.	01355 Environmental Compliance Part 3.8 Discovery of Historical, Archaeological, or Paleontological Objects, Features, Sites, or Human Remains	Construction, Operations and Maintenance
1. Temporarily discontinue work if remains of prehistoric dwelling sites or artifacts of historical or archaeological significance are encountered. Refer to Section 01355.	00820 Legal Relations and Responsibility to the Public 1.12 Protecting and Restoring Property and Landscape	Construction, Operations and Maintenance
Red Cliffs NCA RMP BMP (cultural resources): Where proposed projects or development will adversely affect a cultural resource, testing, data recovery, or full excavation to recover scientific information may be required as mitigation. The applicant or operator bears the full cost of mitigation and is encouraged to consider avoiding adverse effects through project relocation or redesign rather than mitigating adverse effects.	Not applicable	Construction
Prepare biological assessment in coordination with, and receive approval from, the BLM and U.S. Fish and Wildlife Service (USFWS) prior to beginning surface-disturbing activities.	Not applicable	Design, Construction, Operations and Maintenance
BLM-Sensitive Species 1. Obtain authorization before starting any ground-disturbing activity not previously cleared by the department, such as wasting project-generated material; excavating borrow material; and locating equipment, storage areas, office sites, utility lines, or holding ponds. 2. Threatened or endangered species. A qualified biologist, through coordination with the BLM and USFWS biologists and managers, must perform a clearance survey to verify no threatened or endangered or other sensitive species are affected by the activity.	01355 Environmental Compliance 3.7 Environmental Clearance by the Contractor	Construction
Federally Listed Species 1. Obtain authorization before starting any ground-disturbing activity not previously cleared by the department, such as wasting project-generated material; excavating borrow material; and locating equipment, storage areas, office sites, utility lines, or holding ponds. 2. Threatened or endangered species. A qualified biologist, through coordination with the BLM and USFWS biologists and managers, must perform a clearance survey to verify no threatened or endangered or other sensitive species are affected by the activity.	01355 Environmental Compliance 3.7 Environmental Clearance by the Contractor	Construction

Design Feature	UDOT Construction Specification (UDOT 2017)	Applicability
Red Cliffs NCA RMP BMP (fish and wildlife management and special status species): • Existing plant location records will be consulted and site inventories will be conducted to identify suitable habitat for these plants. Surveys for occupied suitable habitat will be conducted prior to any ground disturbance. Surveys will take place when the plants can be positively identified, during the appropriate flowering periods. Surveys will be conducted by qualified field botanists/biologists who will provide documentation of their qualifications, experience, and knowledge of the species prior to starting work. • For BLM-sensitive species surface-disturbing activities will be avoided within 100 meters of occupied plant habitat wherever possible and where geography and other resource concerns allow. Fragmentation of existing populations and identified areas of suitable habitat will be avoided wherever possible. • Where development is allowed within 100 meters of occupied habitat for Threatened, Endangered, Proposed, and Candidate species or BLM-sensitive species, unauthorized disturbance of plant habitat will be avoided by onsite guidance from a biologist, and by fencing the perimeter of the disturbed area, or such other method as agreed to by the USFWS. In such instances, a monitoring plan approved by the Service will be implemented for the duration of the project to assess impacts to the plant population or seed bank. If detrimental effects are detected through monitoring, corrective action will be taken through adaptive management.	Not applicable	Design, Construction, Operations and Maintenance
Install barrier fencing, shade structures, and under-road passages for Mojave desert tortoise.	Not applicable	Design, Construction, Operations and Maintenance
Red Cliffs NCA Biological Opinion: Install tortoise barrier fencing along heavily traveled public use roadways in the NCA to minimize tortoise injuries and mortalities caused by motorized vehicles.	Not applicable	Design, Construction, Operations and Maintenance
Red Cliffs NCA RMP BMP (fish and wildlife management and special status species): Fences constructed will comply with applicable wildlife fence standards, such as those described in BLM Handbook H-1741-1, Fencing (BLM 1989). Current standards for fencing cattle out in deer and elk range is a 4-strand fence, 40 inches high, with a spacing of wires from ground to top of 60 inches (smooth bottom wire), 6 inches (second wire barbed), 6 inches (third wire barbed), and 12 inches (top wire preferably smooth but may need to be barbed in areas of intense cattle use).	Not applicable	Design, Construction, Operations and Maintenance
Mojave desert tortoise fencing and shade structures: UDOT would install and maintain Mojave desert tortoise exclusion fencing and shade structures along the approved ROW in accordance with the most recent USFWS guidance as incorporated into the Final POD. Fencing precludes Mojave desert tortoise from entering the construction area or completed highway and shading provides thermal and predation cover for desert tortoise that encounter the exclusion fencing and pace along it. Attachment 1 in Appendix D provides additional guidance on this measure. Maintenance may be conducted through coordination with Washington County or other entities.	Not applicable	Design, Construction, Operations and Maintenance
Under-road passages for Mojave desert tortoise: The roadway design included in the Final POD would incorporate passageways underneath the highway that could be used by Mojave desert tortoise where exclusion fencing has been placed along the highway. General locations for eight passages are provided in the POD, although they are expected to be further refined through any additional monitoring and/or field surveys and new information that may be available at the time of design (1) to ensure effective placement for the Mojave desert tortoise and other wildlife species where concentrated use or burrows are found and (2) for technical and economic feasibility for design, construction, and long-term maintenance. To the extent consistent with project design and engineering and reasonably feasible, UDOT would consider additional locations for desert tortoise passages where natural topography creates an opportunity. Passageways would vary in size and be developed in final design of the project in coordination with the BLM, with the goal of achieving the following general design elements: • Creating passages of sufficient size, based on the best available information at the time, to promote usage by desert tortoise. • Incorporating natural light through sizing the passage appropriately and incorporating ceiling grates, open air sections, or other elements that allow for natural light throughout the passage. • To the extent feasible, establishing a natural surface continuous with the surrounding environment and incorporating appropriate vegetation and substrate along the bottom through the passages. • Focusing on fill areas and natural drainages to maximize the size of openings where consistent with natural topography. In development of the final design, UDOT would reasonably consult with the BLM, USFWS, and Utah Division of Wildlife Resources when determining the appropriate type of structure, sizing, and placement of under-road passages for Mojave desert tortoise as discussed above. Such determinations would be made based on current monitoring data, findings regarding minimizing fragmentation, construction techniques, and the availability of new technology or equipment and reasonable feasibility to incorporate such technology into the project design, realizing technology may be improved at the time the roadway is constructed. Any deviations based on site-specific conditions, topography, or design and engineering from the established parameters would be subject to review and approval by the BLM. UDOT would select the final structure type for the passages, which may incorporate culverts, bridges (including bridge extensions and piers), flyover intersections (rather than at-grade), pre-cast structures, or other methods that achieve the goals and parameters listed above, in accordance with current standards and published research studies.	Not applicable	Design, Construction, Operations and Maintenance
UDOT would evaluate and monitor existing passages along State Route 18 for tortoise passage, including, as needed, additional maintenance activities and debris removal. UDOT would also consider modifying the structure design to improve tortoise passage as feasible. Modifications would ideally occur in conjunction with future road construction projects scheduled for the same area, or funding can be directed toward this project from the Habitat Conservation Plan (HCP) Partners (e.g., BLM, USFWS, or UDNR).	Not applicable	Design, Operations and Maintenance

Design Feature	UDOT Construction Specification (UDOT 2017)	Applicability
Protect Shivwits milkvetch habitat through the use of protective measures.	Not applicable	Design, Construction, Operations and Maintenance
Red Cliffs NCA Biological Opinion: Use protective measures, such as natural barriers, fencing, signing, and trail designation, to protect populations of and habitat for Shivwits milkvetch habitat.	Not applicable	Design, Construction, Operations and Maintenance
Use wildlife escape ramps, as appropriate, through coordination with BLM and USFWS.	Not applicable	Design, Construction
1. Locate wildlife escape ramps by type as shown. 2. Clear and grade within the footprint of the wildlife escape ramp to permit proper installation. 3. Install wildlife escape ramp according to FG Series Standard Drawings. 4. Place embankment material for ramp as shown on the isometric view. Refer to FG Series Standard Drawings. 5. Cover the wildlife escape ramp with topsoil, broadcast seed, and Hydraulic Erosion Control Products (HECP) Type 1 mulch after placing embankment. Refer to Sections 02912, 02922, and 02911.	02827 Wildlife Escape Ramps 3.1 Installation	Design, Construction
Coordinate with public and private land owners to receive legal right to access before any work is performed and continue through construction to avoid damage to property or other resources (e.g., property markers, trees to remain, etc.) in the area.	Not applicable	Design, Construction, Operations and Maintenance
1. Preserve public and private property during the work. 2. Secure legal right to access the property before any work is performed on public or private property. All damage as a result of trespass will be the financial responsibility of the contractor, including additional acquisition costs. 3. Accept liability for any damage to public or private property resulting from defective work, materials, or non-execution of the contract until contract completion. 4. Restore damaged property and items removed temporarily during construction to a condition similar or equal to that existing before the damage.	00820 Legal Relations and Responsibility to the Public 1.12 Protecting and Restoring Property and Landscape	Construction, Operations and Maintenance
1. Land monuments, property markers, or official datum points: a) Protect until their removal is approved. b) Reference for re-establishment before removing. 2. Protect trees from damage to roots and branches if they are designated to remain. 3. Protect other vegetation and objects designated to remain.	02231 Site Clearing and Grubbing 3.6 Protection	Design, Construction
1. Preserve public and private property during the work. 2. Secure legal right to access the property before any work is performed on public or private property. All damage as a result of trespass will be the financial responsibility of the contractor, including additional acquisition costs. 3. Accept liability for any damage to public or private property resulting from defective work, materials, or non-execution of the contract until contract completion. 4. Restore damaged property and items removed temporarily during construction to a condition similar or equal to that existing before the damage. 5. Temporarily discontinue work if remains of prehistoric dwelling sites or artifacts of historical or archaeological significance are encountered. Refer to Section 01355.	00820 Legal Relations and Responsibility to the Public 1.12 Protecting and Restoring Property and Landscape	Design, Construction
1. Stop Work Order: a) The engineer can order work on a project stopped, wholly or in part, when it is determined a situation exists that requires that work be stopped until the situation can be corrected. b) The engineer will provide a Stop Work Order, within 3 calendar days of verbal notification, that describes the reason for ordering work to stop and what actions need to be taken or how conditions need to change before work may resume. c) The engineer will notify the contractor when to resume work. 2. Work may be stopped for any of the following reasons: a) Contractor's failure to comply with the contract. b) Contractor's failure to keep insurance coverage according to 00820 and this Section of the Standard Specifications. c) Contractor's failure to provide workers or equipment as previously mentioned in this Section of the Standard Specifications. d) Abandonment of work or default of contract upon notice as provided in this Section of the Standard Specifications. e) Unsuitable weather or soil conditions. f) Unusual conditions that affect the work and are not usually associated with the highway construction. g) Conditions exist that threaten the safety of workers, public, or nearby property.	00555 Prosecution and Progress 1.14 Stop Work Orders	Construction
1. Perform work within or adjacent to State or national forest under regulations of the State fire marshal, conservation commission, forestry department, or other authority having jurisdiction governing the protection of forests. 2. Prevent and assist with the suppression of forest fires. 3. Cooperate with responsible forestry officials.	00820 Legal Relations and Responsibility to the Public 1.7 Protecting Forests	Construction, Operations and Maintenance

Design Feature	UDOT Construction Specification (UDOT 2017)	Applicability
1. Establish a local public information office. Office may be located within the contractor's regular office provided the telephone number is a local call or toll-free number for project stakeholders. a) Maintain established working hours and days. b) Provide a telephone or cell phone with voice mail capability dedicated to project public information services. 2. Maintain daily communication with the engineer. 3. Maintain and document weekly communications with region public involvement manager, affected residents, businesses, organizations, and public agencies, such as local emergency services, public works, transit authorities, city offices, and other stakeholders.	01540 Public Information Services 1.7 PIC Responsibilities	Construction
1. Maintain and document weekly communication and project updates with the following: a) Department, region, and public involvement manager b) Affected local public agencies c) Emergency service agencies 1) Fire departments 2) Police departments and highway patrol 3) Ambulance services d) Local city offices e) Public works departments f) Local transit authorities g) Local school districts h) Local U.S. Postal Service i) Affected businesses j) Affected trucking and carrier associations k) Local organizations interested in the project l) Private citizens when requested m) Engineer and region public involvement manager, providing copies of logbook documentation n) Other stakeholders as required	01540 Public Information Services 3.1 Establish Local Public Information Services	Construction
1. Responsibilities and duties are to coordinate project traffic control with emergency services and local law enforcement agencies.	01554 Traffic Control 1.10 Traffic Control Maintainer	Construction
1. Provide emergency maintenance on a 7-day per week, 24-hour basis until substantial completion of the project. 2. Respond within 15 minutes and be onsite within 30 minutes, plus travel time, when contacted by the dispatcher. 3. Provide contacts and telephone numbers to the engineer for the emergency service.	02892 Traffic Signal 3.24 Traffic Signal Maintenance During Construction	Construction
Conduct site clearing in accordance with BLM BMPs and UDOT specifications, including vegetation removal and topsoil stockpiling.	Not applicable	Design, Construction
1. Backfill all stump holes, cuts, depressions, and other holes resulting from clearing and grubbing within areas to receive embankment. a) Compact backfilled areas to the density of the surrounding ground. 2. Measure and pay separately for materials used for backfilling under roadway excavation or borrow. 3. Consider roadway excavation and borrow as incidental to the work when these items are not included in the bid proposal. a) No separate measurement or payment made in this case.	02231 Site Clearing and Grubbing 3.3 Backfilling	Construction
1. Dispose of material. Refer to Section 01355. 2. Do not dispose of material within the designated roadbed. 3. Outside the right-of-way: a) Acceptable when done according to prevailing laws, including environmental laws, ordinances, regulations, and rules. 4. Inside the right-of-way: a) Bury material at locations specified by or acceptable to the engineer. b) Use material to widen embankments and flatten embankment side slopes as approved by the engineer. c) Cover disposed material with at least 2 feet of earth and grade to drain properly. d) Reduce wood to chips a maximum of.5 inch thick for mulching cut and fill slopes. 1) Chips may be buried or distributed uniformly on the ground surface and mixed with the underlying earth so the mixtures will not sustain burning.	02231 Site Clearing and Grubbing 3.4 Disposal	Construction

Design Feature	UDOT Construction Specification (UDOT 2017)	Applicability
1. Grub the areas 2 feet below natural ground, within the limits of clearing, of all stumps, roots, buried logs, and all other underground obstructions. 2. Stumps, roots, and non-perishable solid objects may remain in cleared areas where the embankment is: a) 2 feet or more above the natural ground. b) At least 2 feet away outside the slope stake lines. 3. Completely grub stumps and roots where a structure is to be constructed, piles are to be driven, or unsuitable material is to be removed.	02231 Site Clearing and Grubbing 3.2 Vegetation Removal	Construction
1. Strip the topsoil: a) Only from areas shown or determined by engineer. b) To a depth determined by the engineer. 2. Remove and dispose of any roots larger than 2 inches in diameter or 12 inches in length. 3. Stockpile stripped topsoil: a) At locations acceptable to the engineer. b) So that placement or activity around the stockpile does not damage or impact any existing trees, shrubs, or environmentally sensitive areas. Obtain appropriate clearances if such impacts are unavoidable. 4. Grade to minimize erosion on and around the stockpiles.	02912 Topsoil 3.2 Strip and Stockpile Topsoil	Design, Construction
1. Topsoil free of: a) Subsoils (no B or C horizon soils). b) Coarse sand and gravel. c) Stiff clay, hard clods, or hard pan soils. d) Rock larger than 3 inches in any dimension. e) Trash, litter, or refuse. f) Noxious weeds and weed seeds.	02912 Topsoil 2.1 Contractor-Furnished Topsoil	Construction
Red Cliffs NCA RMP BMP (noxious and invasive weed prevention): Minimize soil disturbance. To the extent practical, native vegetation shall be retained in and around project activity areas and soil disturbance kept to a minimum.	Not applicable	Construction
Red Cliffs NCA RMP BMP (fish and wildlife management and special status species): Where linear disturbance is proposed edges of vegetation shall be feathered to avoid long linear edges of habitat and allow for greater habitat complexity for wildlife.	Not applicable	Design, Construction
Grade roadway and adjacent slopes according to BLM and UDOT specifications.	Not applicable	Design, Construction
Red Cliffs NCA RMP BMP (visual resources): All new roads will be designed and constructed to a safe and appropriate standard, “no higher than necessary” to accommodate intended vehicular use. Roads will follow the contour of the land where practical.	Not applicable	Design, Construction
1. Environmental clearance by the contractor: a) Obtain authorization before starting any ground-disturbing activity not previously cleared by the department, such as wasting project-generated material, excavating borrow material, locating equipment, storage areas, office sites, utility lines, or holding ponds. 2. Federal Emergency Management Agency (FEMA) floodplains. Provide documentation as determined by the engineer to verify no FEMA Special Flood Hazard Areas (SFHA) are impacted by the activity.	01355 Environmental Compliance 3.7 Environmental Clearance by the Contractor	Design, Construction
Paint all facilities a color that best allows the facility to visually blend with the background.	Not applicable	Design, Construction, Operations and Maintenance
Red Cliffs NCA RMP BMP (visual resources): Paint all facilities a color that best allows the facility to blend with the background.	Not applicable	Design, Construction, Operations and Maintenance
Design any lighting proposed for the roadway to reduce impacts to dark night skies.	Not applicable	Operations and Maintenance
Red Cliffs NCA RMP BMP (visual resources): Impacts to dark night skies will be prevented or reduced through the application of specific mitigation measures identified in activity level planning and National Environmental Policy Act (NEPA) level review. These measures may include directing all light downward, using shielded lights, using only the minimum illumination necessary, using lamp types, such as sodium lamps (less prone to atmospheric scattering), using circuit timers, and using motion sensors.	Not applicable	Design, Construction
Roadway Lighting: Lighting installation within the ROW would be minimized to only emergency lighting where the roadway crosses the NCA, except where additional lighting is necessary near intersections or other areas that would support safety and proper visibility for vehicles and pedestrians.	Not applicable	Design, Construction

Design Feature	UDOT Construction Specification (UDOT 2017)	Applicability
Minimize noise generated by construction activities.	Not applicable	Construction
1. Avoid construction activities causing sound levels to exceed 95 decibels (dBA) in daytime (7 a.m. to 9 p.m.) or 55 dBA in nighttime (9 p.m. to 7 a.m.) within 10 feet of the nearest noise receptor. 2. Schedule work to minimize noise disturbance on Sundays and holidays in areas with noise receptors. 3. Percussive noise: a) Notify the engineer, the affected noise receptors, and the local government authority (if applicable) at least 2 weeks in advance of percussive noise activity.	01355 Environmental Compliance 3.6 Noise Control	Construction
Reclaim site, including cleaning up of construction materials, establishing clear zone adjacent to the roadway and placing topsoil.	Not applicable	Construction
1. Remove and dispose of flagging, lath, stakes, and other staking material after the project has reached physical completion and the engineer has approved removal.	01721 Survey 3.15 Cleanup	Construction
1. Clean and finish areas within the clear zone as follows: a) Remove protrusions or depressions greater than 3 inches within the clear zone, such as rocks, boulders, ridges, and stumps. b) Remove trees and provide proper sight distance. c) Determine clear zone according to American Association of State Highway Transportation Officials (AASHTO) Roadside Design Guide when not shown. 2. Clean drainage facilities of debris and obstructions caused by construction. a) Dispose of material removed. 3. Remove or cover with fine material from roadway excavation or borrow, large rocks or boulders on fill slopes with the following exception: a) Large rocks and boulders protruding from the final graded surface 6 inches or less, on slopes steeper than 3:1 or beyond the clear zone. 4. Do not undercut the slope on cut slopes. a) Remove all overhanging rocks. b) Solid ledge rock or partially buried boulders 0.33 cubic yards or more may be left in place on slopes steeper than 4:1 beyond the clear zone. 5. Clean and finish areas within right-of-way limits as follows: a) Remove all dead trees and shrubs. b) Prune trees and shrubs as required. c) Trim and shape trees to provide horizontal sight distance and 20 feet vertical clearances above the roadway. d) Remove undesirable live trees, shrubs, and all fruit trees to a depth of 18 inches below natural ground. e) Dispose of trash and debris. 6. Clean and finish areas within staging and office sites as follows: a) Clean up and finish as specified for finishing local material source sites, including seeding and mulching. Refer to Section 01455.	01741 Final Cleanup	Construction
1. Complete final grading, trench settling, and surface preparation before placing topsoil. 2. Place and spread topsoil as the slope is being constructed on steep cut slopes steeper than 2:1 and higher than 15 feet that require the placement of topsoil. Finish according to this Section, Article 3.3, paragraph D. 3. Provide a suitable topsoil surface just before seeding on the remaining top soiled areas not covered under this article, paragraph B. Suitable topsoil surface is: a) Non-compacted and finished according to this Section, Article 3.3. b) Weed free. c) Finish grade uniform surface with smooth transitions between grade changes and disturbed areas. 4. Do not strip or handle wet topsoil. 5. Establish finish grade at 1 inch below the top of all walks, curbs, mow strips, and other hard surfaces for areas receiving seed or turf seed and 1.5-inches for areas receiving turf sod.	02912 Topsoil 3.1 General Requirements	Construction
1. Clear area to receive topsoil of all trash, debris, weeds, and rock 3 inches or larger, and dispose of objectionable material in an approved manner. 2. Place and spread the stockpiled topsoil over the prepared slopes to the plan depths. Use 4 inches if no depth is indicated in the plans. 3. Disc or harrow the placed topsoil along the contour on slopes 3:1, and flatter or cat-track the slopes to create continuous cleat tracks that run parallel with the contours. 4. Cat-track slopes steeper than 3:1 to create continuous cleat tracks that run parallel with the contours.	02912 Topsoil 3.3 Spread Stockpiled and Contractor-Furnished Topsoil	Construction
Red Cliffs NCA RMP BMP (soils): Determine the volume of available topsoil existing on the site. Topsoil shall be spread at a minimum compacted depth of 4 inches (or as appropriate determined by soil type).	Not applicable	Construction
Red Cliffs NCA RMP BMP (water resources): Use mechanical treatment methods to roughen and aerate soils in degraded sites identified for reclamation.	Not applicable	Construction

Design Feature	UDOT Construction Specification (UDOT 2017)	Applicability
Revegetate site according to BLM and UDOT specifications, including reseeding with BLM-approved seed mixes and planting requirements established by Washington County and/or St. George City.	Not applicable	Design, Construction, Operations and Maintenance
1. Complete all final grading, irrigation work, trench settling, topsoil placement, and surface preparation before seed or sod application. 2. Prepare general seedbed for all seeded and sodded areas. a) Verify that a suitable topsoil surface has been prepared according to Section 02912 before seeding. b) Do not work topsoil or seed when the soil is saturated or frozen. 3. Prepare turf seedbed: a) Review finish grade to confirm that topsoil is 1 inch below the top of all walks, curbs, mow strips, and other hard surfaces. b) Apply fertilizer at the rate of 2 pounds/100 square yards, and mix thoroughly into upper 2 inches of topsoil. c) Do not apply fertilizer and seed at the same time in the same machine. 4. Prepare turf sod surface: a) Review finish grade to confirm that topsoil is 1.5 inches blow the top of all walks, curbs, mow strips, and other hard surfaces. b) Apply fertilizer at the rate of 2 pounds per 100 cubic yards, and mix thoroughly into upper 2 inches of topsoil. c) Level and roll prepared areas using a 21-gallon, water-filled hand roller containing 8 to 10 gallons of water. d) Lightly rake and dampen with water the top.125 to.625 inches of soil just before laying the sod.	02922 Seed, Turf Seed, And Turf Sod 3.1 Preparation	Construction
1. Notify the engineer 7 working days before seeding. 2. Apply seed at the rate indicated in the seed schedule as shown. Note that drill seed and broadcast seed are applied at different rates.	02922 Seed, Turf Seed, And Turf Sod 3.2 Seeding - General	Construction
1. Use the drill method of seeding on accessible slopes 3:1 and flatter. 2. Use a drill equipped with the following: a) Depth band. b) Seed box agitator. c) Seed metering device. d) Furrow opener. e) Packer wheels or drag chains. 3. Use the drill manufacturer's directions in the presence of the engineer. Calibrate the drill to apply seed at the rate indicated in the seeding schedule. 4. Space drill rows a minimum of 6 inches and a maximum of 8 inches. 5. Fill the seed boxes no more than half full when drilling on a slope. 6. Set depth bands to drill seeds to a.5 inch depth. 7. Drill along the contour. 8. Maintain the drill at the calibrated setting throughout the seeding operation. 9. Allow the furrows that are created by the drill to remain.	02922 Seed, Turf Seed, And Turf Sod 3.3 Drill Seeding Method	Construction
1. Use the broadcast method of seeding under the following conditions: a) Slopes steeper than 3:1. b) Slopes 3:1 and flatter where the area to be seeded is inaccessible to drill. c) The area to be seeded is not large enough to justify using a drill. d) Rocky surface conditions will damage a drill. 2. Obtain approval of the broadcast method by demonstrating the procedure on a 100-cubic-yard area. 3. Evenly broadcast seed using either: a) A cyclone seeder or other approved mechanical seeder. b) A hydroseeder. 1) Apply seed, water, and 300 pounds of cellulose fiber mulch (tracer) per acre. 4. Do not seed during windy weather or when soil is saturated. 5. Incorporate the seed into the soil by one of three methods: a) Cat-tracking by running the dozer up and down the slope, creating continuous cleat tracks that run parallel with the contours. b) Hand-raking the seed.5-inch deep and along the contours of the slope. c) Slope-chaining by pulling the chain along the contour until the seed is covered. 6. Obtain approval from the engineer that the seed has been adequately incorporated into the soil before applying wood fiber mulch, erosion control blanket, flexible growth medium, flexible channel liner, or other topdressing.	02922 Seed, Turf Seed, and Turf Sod 3.4 Broadcast Seeding Method	Construction

Design Feature	UDOT Construction Specification (UDOT 2017)	Applicability
1. Verify that the area prepared to receive plants is graded properly according to the plan, all work is completed in the area, and that topsoil has been placed. Refer to Section 02912. 2. Install the irrigation system, and have it fully operational before installing plants. 3. Stake or delineate plant locations for approval before installation.	02932 Trees, Shrubs, and Groundcovers 3.1 Preparation	Construction
1. General: a) Install plants using the plan details. b) Water the plants within 1 hour of installation to saturate the root ball to a minimum of 4 inches below and around the plant hole. 1) Add more backfill if settling occurs. 2. Containerized plants: a) Excavate plant holes to twice the diameter and the same depth of the root ball. b) Carefully remove the plant from its container, scarify the sides and bottom of the root ball if needed, and place it in the prepared hole. c) Place excavated soil in 4-inch lifts around the root ball, and eliminate voids by tamping the soil between each lift. 3. Balled and burlapped plants: a) Excavate plant holes to twice the diameter and the same depth of the root ball. b) Gently place the plant in the prepared hole with burlap securely intact. c) Do not mishandle or break root balls. d) Carefully remove any wire baskets and the top half of the burlap without disturbing the root ball. 4. Tubeling plants: a) Auger a hole the same size as the tube. b) Gently place watered tubeling in the prepared plant pit immediately following excavation of the hole so the roots are not tangled, compacted, or curled up at the ends. c) Compress the soil at the base of the tubeling to eliminate voids between the root ball and existing soil.	02932 Trees, Shrubs, and Groundcovers 3.1 Installation	Construction
Red Cliffs NCA RMP BMP (water resources): Use vegetation or structures to stabilize and protect banks of streams, lakes, or excavated channels against scour and erosion.	Not applicable	Design, Construction, Operations and Maintenance
Prepare a Reclamation Plan.	Not applicable	Design, Construction
UDOT would prepare a Reclamation Plan for the highway ROW for approval by the BLM. The Reclamation Plan would support the goal of returning the land to be reclaimed to a condition approximate to or more productive than that which existed before disturbance. The Reclamation Plan would include at least the following elements: (1) Reclamation timing, (2) Topsoil and Subsoil Measures, (3) Recontouring, Seeding, and Outplanting Measures, (4) Weed Control, (5) Performance Standards, (6) Reclamation Monitoring, including reference sites (qualitative and quantitative), (7) Reclamation Success Criteria, and (8) BLM Reclamation Goals and Process.	Not applicable	Construction
Only native plant species would be used in reclamation activities. Locally derived seed is preferred. Restoration of biocrusts and associated mycorrhizal fungi should be considered in the Reclamation Plan. Fill materials would be free of fines, waste, and pollutants, and must be certified weed-free. The BLM would inspect reclamation activities at the end of construction to ensure disturbed areas are revegetated/restored according to the performance standards within the approved Reclamation Plan.	Not applicable	Construction
Broadcast applications of herbicides would be prohibited within the project area; if necessary, spot treatments would be applied by hand using herbicides approved by the U.S. Environmental Protection Agency and BLM in order to treat noxious weeds. The highway project area would be monitored and controlled, as necessary, for weeds for the life of the ROW grant (which may include maintenance activities).	Not applicable	Construction
Prepare Traffic Control Plan to minimize interference with traffic during performance of the work.	Not applicable	Design, Construction
1. Perform work with minimal obstruction to traffic. 2. Follow the safety provisions of all applicable laws, rules, codes, and regulations to protect the safety and convenience of the public and property. 3. Provide, erect, and maintain all traffic control devices, such as barriers, barricades, and warning signs, according to the Traffic Control Series Standard Drawings and Section 01554 requirements to protect the work and the public safety. a) Use barriers and barricades to delineate highway sections closed to traffic. b) Illuminate obstructions during darkness, and provide warning signs to control and direct traffic. 4. Erect warning signs for work that may interfere with traffic or where new work crosses or coincides with an existing road. a) Place and maintain warning signs according to the authorized Traffic Control Plan. b) Obtain approval before dismantling or removing traffic control devices. 5. Pedestrians: a) Place and maintain warning signs according to the authorized Traffic Control Plan. b) Provide Americans with Disabilities Act-compliant access in areas where construction interferes with existing access.	00820 Legal Relations and Responsibility to the Public 1.11 Public Convenience and Safety	Design, Construction

Design Feature	UDOT Construction Specification (UDOT 2017)	Applicability
1. Minimize interference with traffic during performance of the work. 2. Sunday and Category I holiday work: a) Provide advance notice to the engineer no later than noon on Wednesday or 4 calendar days prior, whichever is greater, before any Sunday or Category I holiday work, unless otherwise restricted in the contract. 3. Category II holiday work: a) Do not perform any work without approval except for repairing or servicing equipment, protecting work, maintaining or curing concrete, and maintaining traffic on Category II holiday. b) Provide notice to the engineer no later than noon on the Wednesday or 4 calendar days prior, whichever is greater, before any Category II holiday work, unless otherwise restricted in the contract. 4. Night work: a) Notify the engineer at least 5 calendar days before starting night work. b) Provide adequate lighting for safely performing satisfactory inspection and construction operations. c) Control noise.	00555 Prosecution and Progress 1.9 Limitation of Operations	Design, Construction
1. Keep roads open to traffic during the work and work suspensions, or provide and maintain detour roads as specified or directed. a) Maintain all necessary accesses to areas, such as parking lots, garages, businesses, residences, and farms. b) Exclude snow removal. 2. The department does not provide additional compensation for maintenance. Failure to maintain traffic is cause for the department to take action to meet the requirements of this specification. a) The department deducts its costs incurred in such actions from money due.	00725 Scope of Work 1.8 Maintaining Traffic	Design, Construction
1. Maintain work included in the contract during construction until physical completion. a) Maintain traffic detour routes and project travel ways according to the Traffic Control Plan. 2. The engineer immediately notifies the contractor of failure to meet these provisions. a) The department maintains the project if unsatisfactory maintenance is not remedied within 24 hours after receiving notice. b) The department deducts the entire cost to maintain the work from the money due or to become due the contractor.	00727 Control of Work 1.17 Maintain the Work During Construction	Construction
1. Follow the authorized Traffic Control Plan.	01554 Traffic Control	Design, Construction
Prepare Stormwater Pollution Prevention Plan.	Not applicable	Design, Construction, Operations and Maintenance
1. Remove temporary environmental controls when surrounding disturbed areas have met final stabilization measures, except as follows: a) Do not remove perimeter controls, such as silt fence, fiber rolls, or straw bales, when they protect a wetland or waterway unless the surrounding area meets final stabilization requirements identified within the Utah Construction General Permit (UCGP). b) When the engineer determines that controls should remain in place. 2. Remove temporary environmental fence and posts upon completion of construction.	01571 Temporary Environmental Controls 3.4 Removal	Construction, Operations and Maintenance
1. Install appropriate controls as shown before beginning earth-disturbing activities. 2. Refer to installation procedures outlined in EN Series Standard Drawings and the AASHTO Construction Stormwater Field Guide. 3. Install temporary environmental fence in the required locations before construction activities begin. a) Install posts at a 12-feet maximum spacing so the fence does not sag more than 2 inches between posts. b) Weave the fence over the support posts alternating every two loops, and secure it to the posts with fasteners. 4. Install gutter-inlet barrier according to manufacturer's recommendations.	01571 Temporary Environmental Controls 3.1 Installation	Construction
1. Check installed controls before and after each rain event to verify proper working function and compliance with the UCGP. 2. Replace controls that are not properly working to prevent erosion and sedimentation.	01571 Temporary Environmental Controls 3.2 Inspection	Construction
1. Maintain controls to function properly until surrounding disturbed areas have met final stabilization measures. 2. Remove accumulated sediments from controls when depth reaches 50 percent of the control height or when it interferes with the performance of the control. 3. Properly dispose of accumulated sediment.	01571 Temporary Environmental Controls 3.3 Maintenance	Construction

Design Feature	UDOT Construction Specification (UDOT 2017)	Applicability
1. Complete all required grading, topsoil placement, and seeding in designated areas before installing Rolled Erosion Control Products (RECP). 2. Make soil surface stable and firm and free of rocks, roots, and other obstructions. 3. Apply the RECP within 24 hours after seeding.	02376 Rolled Erosion Control Products 3.1 Preparation	Construction
1. Minimize disturbance of the prepared seedbed when installing the product. 2. Install product according to manufacturer's recommendations. 3. Unroll product parallel to the primary direction of flow, and place it in direct contact with the soil. a) Do not stretch the product or allow it to "tent" or bridge over surface inconsistencies during installation. 4. Install flexible channel liner or turf reinforcement mat within a channel, ditch, or swale to allow runoff to flow directly to the centerline of ditch, not undermining or bypassing the lined ditch. 5. Place additional staples in areas, such as swales, base of humps, against rock outcrops, and as required, achieving maximum contact between the product and the soil.	02376 Rolled Erosion Control Products 3.2 Installation	Construction
1. Complete required grading, topsoil placement, and seeding in designated areas before applying Hydraulic Erosion Control Products (HECP). 2. Apply HECP within 24 hours after seeding. 3. Provide sufficient time for HECP to cure according to manufacturer's recommendation before precipitation falls.	02911 Hydraulic Erosion Control Products 3.1 Preparation	Construction
1. Check installed controls before and after each rain event to verify proper working function and compliance with the UCGP. 2. Replace controls that are not properly working to prevent erosion and sedimentation.	01571 Temporary Environmental Controls 3.2 Inspection	Design, Construction, Operations and Maintenance
1. Comply with the Utah State Stream Alteration Program. 2. Comply with Section 10 of the Rivers and Harbors Act. 3. Comply with Section 404 of the Clean Water Act. 4. Comply with UCGP requirements for projects with one or more acres of soil disturbances (clearing, grading, or excavating). a) Designate an individual, other than the superintendent, as the Environmental Control Supervisor (ECS) with the following responsibilities: 1) Coordinate with the engineer about UCGP requirements and environmental commitments. 2) Manage implementation, modification, and record-keeping of the project Stormwater Pollution Prevention Plan (SWPPP). 3) Supervise the installation, maintenance, and removal of BMPs. 4) Conduct SWPPP inspections. 5) Be available 24 hours a day, 7 days a week, and be onsite within a reasonable amount of time from notification as determined by the engineer. b) Complete the draft SWPPP for the project. c) Submit the Notice of Intent (NOI) to the Utah Division of Water Quality (DWQ) after the SWPPP has been signed by the engineer. d) Conduct SWPPP inspections at least once a week and within 24 hours following a storm event with a total rainfall amount of.5 inch or greater once earth-disturbing activities have begun. e) Coordinate with the engineer to determine if the project has met UCGP requirements before submitting the Notice of Termination (NOT) to DWQ. 5. Comply with the National Flood Insurance Program for a project within a SFHA, as defined by FEMA.	01355 Environmental Compliance 3.3 Water Resource Permits	Design, Construction, Operations and Maintenance
1. Obtain authorization before starting any ground-disturbing activity not previously cleared by the department, such as wasting project-generated material, excavating borrow material, and locating equipment, storage areas, office sites, utility lines, or holding ponds. 2. Federal- or State-regulated waters. Provide documentation as determined by the engineer to verify no Waters of the U.S. and State of Utah waters are impacted by the activity.	01355 Environmental Compliance Part 3.7 Environmental Clearance by the Contractor	Construction
SWPPP for approval.	01355 Environmental Compliance 1.5 Submittals	Construction
1. Environmental clearance by the contractor a) Obtain authorization before starting any ground-disturbing activity not previously cleared by the department, such as wasting project-generated material, excavating borrow material, and locating equipment, storage areas, office sites, utility lines, or holding ponds. 2. UCGP. Provide a separate SWPPP for UCGP compliance as determined by the engineer when disturbing more than 1 acre of soil off the project site.	01355 Environmental Compliance 3.7 Environmental Clearance by the Contractor	Construction

Design Feature	UDOT Construction Specification (UDOT 2017)	Applicability
Red Cliffs NCA RMP BMP (soils): • Minimize soil exposure to erosional forces of wind and water by waiting until just before beginning construction to clear vegetation and to disturb the soil. • Disperse stormwater to areas of undisturbed forest/rangeland floor wherever possible, rather than concentrating it into channels. • All construction and travel on the road and right-of-way shall stop until soils dry if ruts greater than 3 inches are formed by vehicles and equipment. • The grant holder shall provide satisfactory reclamation of all sites disturbed by their activity. This may include installation of additional erosion control devices and seeding at the discretion of the BLM authorized officer. • Storm water. BMPs identified in the Storm Water Management Plan shall be in place prior to any earth-disturbing activity. Additional BMPs will be installed as determined necessary by the BLM authorized officer. All temporary BMPs shall be removed once site stabilization and reclamation efforts have been deemed successful by the BLM authorized officer.	Not applicable	Construction
Red Cliffs NCA RMP BMP (water resources): Storm water BMPs identified in the applicant's State-approved SWPPP shall be in place prior to any earth-disturbing activity.	Not applicable	Construction
Prepare a Fugitive Dust Control Plan in coordination with the Utah Department of Air Quality.	Not applicable	Construction, Operations and Maintenance
Do not conduct open burning along highway right-of-way without approval from the Utah Department of Air Quality (DAQ).	01355 Environmental Compliance 3.4 Open Burning	Construction, Operations and Maintenance
1. Submit a Fugitive Dust Control Plan (FDCG) to DAQ for construction activities as defined in UAC R30, such as: a) Disturbing a ground surface greater than.25 acre. b) Demolition activities, including razing homes, buildings, or other structures. c) Material storage, hauling, or handling operations. 2. Minimize fugitive dust from construction activities using methods such as watering and chemical stabilization of potential fugitive dust sources or other methods approved by the DAQ. a) Do not exceed 10-percent opacity caused by fugitive dust at the project boundary and 20 percent within the project site. This requirement does not apply when wind speeds exceed 25 miles per hour, and the operator is taking appropriate actions to control fugitive dust. b) Conduct opacity observations according to U.S. Environmental Protection Agency (EPA) Method 9 for stationary sources. Refer to http://www.udot.utah.gov/go/standardsreferences. c) Use procedures similar to EPA Method 9 to conduct opacity observations for intermittent and mobile sources. 1) The requirement for observations to be made at 15-second intervals over a 6-minute period does not apply. Minimize fugitive dust from material storage, handling, or hauling operations through the use of covers, stabilization, or other methods approved by the DAQ.	01355 Environmental Compliance 3.5 Fugitive Dust	Construction
Apply water for dust control in quantities and locations as directed by the engineer and to maintain environmental compliance. 1. Dust control may be required at any time. 2. Do not waste water.	01572 Dust Control and Watering 3.1 Application	Construction
1. Refer to Section 01355. 2. Contact DAQ and obtain the appropriate Air Quality Permit for the project. Permit application forms can be obtained from DAQ's website. Refer to http://www.udot.utah.gov/go/standardsreferences. Utah Division of Air Quality 195 North 1950 West P.O. Box 144820 Salt Lake City, UT 84116 Phone: (801) 536-4000 Fax: (801) 536-4099 3. Do not proceed with work affecting air quality without an Air Quality Approval Order, Notice of Intent to Approve letter, or a Temporary Approval Order for the project, process, or equipment to be used.	00820 Legal Relations and Responsibility to the Public 1.19 Air Quality Protection	Construction
Prepare a Blasting Plan.	Not applicable	Construction
1. Use explosives, delay fuses, and all blasting materials as recommended by the explosives firm. Refer to National Fire Protection Association (NFPA) 495 – Explosive Materials Code.	02316 Roadway Excavation 2.3 Explosives	Construction
1. Store all explosives securely in compliance with laws and regulations. Refer to Section 00820. Refer to NFPA 495 – Explosive Materials Code. 2. Mark all storage places clearly.	02316 Roadway Excavation 3.2 Blasting Material Storage	Construction

Design Feature	UDOT Construction Specification (UDOT 2017)	Applicability
1. Comply with Occupational Safety and Health Administration Constructions Standards 1926 Subpart U – Blasting and the Use of Explosives. 2. Comply with NFPA 495 – Explosive Materials Code. 3. Provide a qualified explosives expert to act as an advisor and consultant during drilling and blasting operations. 4. Do not blast beyond designated areas.	02316 Roadway Excavation 3.7 Rock Removal – Explosive Method	Construction
Prepare a Noxious Weed Management Plan.	Not applicable	Construction
Red Cliffs NCA RMP BMP (transportation and access). All highway rights-of-way and other road authorizations will contain noxious and invasive weed stipulations that include prevention, inventory, treatment, and revegetation or rehabilitation.	Not applicable	Construction
Prepare Hazard Materials, Hazardous Waste, and Spill Prevention Plan.	Not applicable	Construction
1. Suspend work immediately in an area if abnormal conditions are encountered or exposed during construction that indicate the presence of a hazardous waste. a) Notify the engineer. 2. Do the following if a waste discovered or spilled onsite is considered hazardous by meeting the definition for disclosure as defined in Title 40 CFR Part 261, Subpart D – Lists of Hazardous Wastes. Refer to http://www.udot.utah.gov/go/standardsreferences for a link to a list of hazardous wastes. a) Take appropriate actions to minimize the threat to human health and the environment. b) Contact the engineer, and send notice if waste found onsite is determined hazardous. c) Follow appropriate testing measures to determine if waste is considered hazardous. d) Notify Department of Environmental Quality's (DEO) 24-hour answering service at (801) 536-4123. e) Follow requirements in UAC R315. 3. Coordinate with the engineer to initiate development of a remediation plan according to DEQ and EPA regulations and requirements. a) Pay for costs to address hazardous waste discovery or spill cleanup when caused by contractor's activities. 4. Complete the work required by the remediation plan before resuming operations in the affected area.	01355 Environmental Compliance 3.1 Hazardous Waste	Construction
Spill of petroleum-based product and used oil: 1. Petroleum-based product: a) Contact the engineer if a spill occurs adjacent to waterbody or storm drain inlet. 1) Send notice following the discovery of the spill. 2) Notify DEQ's 24-hour answering service at (801) 536-4123. 3) Coordinate with the engineer to remedy petroleum contaminated soils according to UAC R315-8. 2. Used-oil product: a) Contact the engineer if a spill occurs that exceeds 25 gallons or that poses a potential threat to human health or the environment, such as discharging to groundwater, surface water, or storm drain inlet. 1) Send notice following the discovery of the spill. 2) Notify DEQ's 24-hour answering service at (801) 536-4123. 3) Coordinate with the engineer to develop a remediation plan for spilled used oil according to UAC R315-15. 3. Clean up petroleum-based or used-oil product when caused by contractor's activities.	01355 Environmental Compliance 3.2 Spill of Petroleum-Based Product and Used Oil	Construction
Pollution prevention and general housekeeping: 1. Concrete washout: a) Provide a watertight container onsite before concrete placement activities begin and where concrete trucks, tools, and equipment are to be washed. 1) Size the container to prevent overflows. 2) Do not place within 50 feet of storm drain inlets, open ditches, or watercourses. b) Remove and properly dispose of concrete waste and washout water. 2. Maintain active traffic lanes free from debris, such as mud, dirt, gravel, and other material. 3. Prevent material from entering in storm drain inlets and drainage pipes.	01355 Environmental Compliance 3.9 Pollution Prevention and General Housekeeping	Construction
Red Cliffs NCA RMP BMP (water resources). No operations using chemical processes (except for vegetation management) or other pollutants in their activities will be allowed to occur within 200 feet of any water bodies.	Not applicable	Construction

Design Feature	UDOT Construction Specification (UDOT 2017)	Applicability
Prepare Paleontological Resources Protection Plan.	Not applicable	Construction
1. Obtain authorization before starting any ground-disturbing activity not previously cleared by the department, such as wasting project-generated material, excavating borrow material, and locating equipment, storage areas, office sites, utility lines, or holding ponds. a) Cultural and paleontological. Perform and provide a cultural survey as determined by the engineer to verify no cultural or paleontological resources are affected by the activity.	01355 Environmental Compliance 3.7 Environmental Clearance by the Contractor	Construction
1. Suspend work within the vicinity if historical, archaeological, or paleontological objects, features, sites, or human remains are discovered during construction. a) Provide a 100-feet minimum buffer around the perimeter of the discovery. b) Protect the discovery area. c) Contact the engineer, and send notice of the nature and exact location of the discovery. d) Provide written documentation to the engineer within 2 calendar days of discovery. 2. Do not recommence work within the area of discovery until the engineer provides notice.	01355 Environmental Compliance 3.8 Discovery of Historical, Archaeological, or Paleontological Objects, Features, Sites, or Human Remains	Construction
Prepare a Litter Management Plan.	Not applicable	Construction, Operations and Maintenance
UDOT would develop and implement a Litter Management Plan for the ROW.	Not applicable	Construction, Operations and Maintenance
Install under-road passages and interpretive displays for recreational trails.	Not applicable	Design, Construction, Operations and Maintenance
Recreational trails: UDOT would install under-road passages for each of the three existing recreational trails that cross the ROW. The T-Bone Trail passage may be incorporated into the passage being designed for Mojave desert tortoise. All under-road passages would provide sufficient clearance to allow for safe passage of users and UDOT and the BLM would collaboratively determine the final design to be included in the Final POD.	Not applicable	Design, Construction, Operations and Maintenance
Interpretive displays: UDOT would provide a minimum of eight waypoints along the new hike and bike path and install an interpretive display at each one. The content of the displays would be guided by the Red Cliffs NCA Interpretive Concept Plan and promote public education and understanding of the eight purposes for which the Red Cliffs NCA was designated. UDOT and the BLM would collaboratively determine the final location and design of the waypoints and interpretive displays through the Final POD.	Not applicable	Design, Construction
Implement Mojave desert tortoise measures.	Not applicable	Design, Construction, Operations and Maintenance
Survey and Monitoring 1. Pre-project distribution surveys would be performed within 1 year prior to construction of the highway. 2. Pre-construction clearance surveys would be conducted prior to the initiation of construction. Areas that have been cleared and fenced with permanent fencing would ensure regular monitoring and maintenance of the fenceline (at least annually). 3. Fenceline checks would be conducted prior to activities, any breaches fixed, and if breaches are found, a coarse clearance survey would occur. Increased monitoring in the following 2 weeks and when the more active season starts would also occur.	Not applicable	Construction

Design Feature	UDOT Construction Specification (UDOT 2017)	Applicability
UDOT would hire individuals to conduct the surveys and monitoring with the following qualification requirements: 1. Desert Tortoise Biologist – Authorized desert tortoise biologist(s) would be qualified to perform various activities that may include, but are not limited to, the following: conduct and oversee presence/absence and clearance surveys, handle desert tortoises, translocate desert tortoises, construct burrows, excavate burrows, conduct health assessments (including any necessary bloodwork), and oversee monitoring and compliance during project activities. Authorized biologists should have sufficient desert tortoise field experience in each category (a minimum of 480 hours searching for tortoises and tortoise sign) to detect the presence of desert tortoises through observations of animals and sign including scat and burrows. Authorized biologists must maintain up-to-date Federal and State desert tortoise handling permits when they are conducting any handling activities. In some circumstances, Washington County HCP Administration staff or local State or Federal biologists may be available to serve this function. All desert tortoise biologists would report to and coordinate with the BLM, UDWR, and the Washington County HCP Biologist. The biologist would keep detailed field notes that would be submitted to the BLM and USFWS, Utah Ecological Services Field Office every 3 months. 2. Desert Tortoise Monitor – Desert tortoise monitors are individuals who are approved by the USFWS to: a) assess habitat suitability; b) conduct presence/absence and abundance surveys for desert tortoises; c) monitor project activities within desert tortoise habitat; d) ensure proper implementation of conservation measures outlined in this document; and e) report incidents of non-compliance with the Reasonable and Prudent Measures and Terms and Conditions in the Biological Opinion (BO) issued for the project by the USFWS. Desert tortoise monitors should have enough desert tortoise field experience (a minimum of 480 hours searching for tortoises and tortoise sign) to detect the presence of desert tortoises through observations of animals and sign including scat and burrows. A desert tortoise monitor is not authorized to handle desert tortoises. The monitor would keep detailed field notes and turn them in regularly to the biologist. See example field report form (Daily Desert Tortoise Report Form). 3. Field Contact Representative – Field contact representatives (FCR) are individuals who are approved by the USFWS to: a) monitor some project activities within desert tortoise habitat (i.e., for this project, unsuitable habitat) b) assist with daily clearance sweeps as detailed in the text below; c) assist with proper implementation of protective measures; and d) call the desert tortoise monitor, biologist, BLM, UDWR, or USFWS, with any questions or concerns. The FCRs would not be permitted to assess habitat suitability or conduct USFWS protocol level surveys for desert tortoises because they would not have sufficient training or field experience. Because the project area supports such high densities of desert tortoises, FCRs would not be qualified to monitor within suitable habitat. FCRs would meet the following qualifications: a) can recognize signs of desert tortoises; b) understand monitoring protocols; and c) have a minimum of one field day under the supervision of a desert tortoise monitor in each activity season and habitat type. While FCRs and monitors would not be not authorized to handle desert tortoise or conduct USFWS protocol level surveys, FCRs may, depending on the activity season and habitat quality, assist with daily clearance sweeps for desert tortoises immediately prior to or during project activities. The FCR would keep detailed field notes that would be turned in to the biologist.	Not applicable	Construction

Design Feature	UDOT Construction Specification (UDOT 2017)	Applicability
For Occupied desert tortoise habitat, the following protocols would apply for project activities that occur during the Most Active Season (February 15 to November 30): 1. A desert tortoise biologist would be onsite during all highway project activities for the protection of desert tortoises. The biologist would be responsible for determining compliance with the conservation measures as defined in a BO issued for the highway. 2. No more than 1 hour prior to daily construction activities commencing or by 7 a.m. each work day (whichever is later), a desert tortoise biologist would conduct a clearance sweep of that day's activity area (including a 100-meter zone of influence on all sides) to identify desert tortoises and occupied burrows in the area. The monitor would also carefully inspect any hazards (e.g., trenches or open pipes). If temperatures are cold enough that desert tortoise activity is not expected, the proponent may coordinate with the USFWS to reduce the monitoring requirements. 3. A desert tortoise monitor would be assigned to each grouping of equipment (heavy machines which use power to perform a construction function specific to the machine) operating in spatially disjunct areas within the project site. A grouping of equipment is defined as all construction equipment working within a 1,000-foot linear distance from the first piece of equipment to the last piece of equipment. Equipment performing backfilling, recontouring, and reclamation activities are included in this measure. 4. Project vehicle speeds in the project area would be limited to 15 miles per hour (mph). Speed limit signs would be posted when entering and exiting the project area. 5. Blasting may be required for the highway. Blasting would not be conducted within 100 meters of an occupied desert tortoise burrow due to possible direct effects of this action on burrow stability. The desert tortoise biologist would conduct 10-meter belt transect protocol desert tortoise surveys prior to and within 100 meters of any blasting. If a burrow is occupied, the UDWR, BLM, and USFWS would be contacted to discuss appropriate translocation measures based on the case-specific circumstances. Any contractor performing blasting would comply with applicable regulations, codes, and standards established by the regulatory agencies, and follow the Reasonable and Prudent Measures and Terms and Conditions in the USFWS BO to minimize impacts to desert tortoise. 6. If highway project activities occur during the desert tortoise Most Active Season (February 15 to November 30; highest activity during March 15 to May 15 and August 20 to October 20), UDOT would hold a short refresher meeting with all highway project personnel that would be led by the desert tortoise biologist on February 15 or the first working day just prior to that date and on March 15 and August 20 (or the first working day just prior to those dates). This meeting would include instruction and handouts to remind workers of the highway project's conservation measures. Refresher meetings would be held in addition to the pre-project meeting described in General Measures. However, if the initial pre-project meeting occurred recently (within 1 month prior to the Most Active Season start date, March 15 or October 20), the refresher meeting that would have normally been held on that date is not required. 7. Because shade structures are being installed, once daily fenceline checks by the desert tortoise biologist would be conducted no more than one hour prior to each day's project activities beginning or 7 a.m. (whichever is later). 8. Open trenches and other open excavations would be covered or provided with desert tortoise escape ramps. Excavations left open would be checked each morning for presence of tortoise prior to commencement of daily work and at the end of the work day. Escape ramps would have a slope no steeper than 3:1 and be a minimum of 91.5 centimeters (3 feet) in length. Escape ramps would be placed at 100-meter intervals. These distances would be reduced if the desert tortoise biologist and Federal agencies determine that the plug/escape ramp spacing is insufficient to facilitate animal escape from the trench. 9. No standing water caused by highway project operations would be permitted in desert tortoise habitat because this can attract desert tortoises and predators. Similarly, leaks on water trucks and water tanks would be repaired to prevent pooling water. If watering conditions could temporarily attract desert tortoises, the desert tortoise monitor assigned to a group of equipment constructing the project may periodically leave the group of equipment to patrol each area being watered. 10. The storing and handling of bulk hazardous waste materials would be excluded from the project areas within 600 meters of active tortoise burrows.	Not applicable	Construction
For Occupied habitat, the same measures as above for the Most Active Season would be applied during the Less Active Season (December 1 to February 14), with the following exceptions: 1. A desert tortoise biologist is not required onsite daily. A monitor would remain onsite during all project activities, conduct daily clearance sweeps out to 100-meter zone of influence, check any hazards, and check all backfilling, recontouring, and reclamation activities prior to initiation. A desert tortoise biologist would conduct an initial pre-construction clearance survey and identify any occupied burrows or hibernacula. The biologist would also come out to the site weekly to check in with the monitor, review and collect field notes, and check any hazards. 2. The fenceline would be checked once per day by the biologist or monitor. 3. An FCR would be assigned to each grouping of equipment as described above.	Not applicable	Construction

Design Feature	UDOT Construction Specification (UDOT 2017)	Applicability
For Unsuitable habitat (within the fenced areas of Cottonwood Springs Road and Red Hills Parkway), the following conservation measures would be applied during the Most Active Season (February 15 to November 30): 1. A desert tortoise biologist would conduct an initial pre-construction clearance survey and identify any occupied burrows or other hibernacula adjacent to the desert tortoise exclusion fence. 2. A desert tortoise biologist would come out to the site weekly to check in with the monitor, review and collect field notes, and check any hazards. 3. A monitor would stay onsite and perform a clearance sweep out to 100 meters and check any open trench and any other open excavations at least three times daily. 4. If a desert tortoise or fresh desert tortoise sign is found within the 100-meter zone of influence of the project, the monitor would contact BLM, UDWR, and USFWS to discuss appropriate translocation, avoidance, and minimization measures based on the case-specific circumstances. 5. No standing water caused by project operations would be permitted in desert tortoise habitat as this can attract desert tortoises and predators. Similarly, leaks on water trucks and water tanks would be repaired to prevent pooling water. If conditions favor tortoise activity, the FCR or a desert tortoise monitor assigned to a group of equipment constructing the project may periodically leave the group of equipment to patrol each area being watered. 6. If project activities occur during the desert tortoise Most Active Season (February 15 to November 30; highest activity during March 15 to May 15 and August 20 to October 20), the proponent would hold a short refresher meeting with all project personnel that would be led by the desert tortoise biologist on February 15, March 15, and August 20 (or the first working day just prior to those dates). This meeting would include instruction and handouts to remind workers of the project's conservation measures. Refresher meetings would be held in addition to the pre-project meeting described in General Measures. However, if the initial pre-project meeting occurred recently (within 1 month prior to February 15, March 15, or October 20), the refresher meeting that would have normally been held on that date is not required.	Not applicable	Construction
For Unsuitable habitat (within the fenced areas of Cottonwood Springs Road and Red Hills Parkway), the following measures would be applied during the Less Active Season (December 1 to February 14): 1. The onsite desert tortoise monitor does not need to remain onsite during all project activities. 2. A monitor would perform a sweep of any open trench and any other open excavations once daily. 3. The desert tortoise biologist would visit the site once a week to review field notes and assess any hazards. 4. If a desert tortoise or fresh desert tortoise sign is found within the 100-meter zone of influence of the project, the monitor or FCR would contact BLM, UDWR, and USFWS to discuss appropriate translocation, avoidance, and minimization measures based on the case-specific circumstances.	Not applicable	Construction
All individuals working onsite would be required to take a worker education training class, conducted by the Washington County HCP Office (WCC 2006). The class would describe desert tortoises, and the appropriate measures to take upon discovery of a desert tortoise or burrow. The class would also include a discussion of construction techniques and conservation measures to minimize potential adverse impacts. All project personnel would sign an affidavit certifying that they have read and understand the material presented in the brochure and class. UDOT would work with Washington County to maintain all records of affidavits.	Not applicable	Construction
Before project activities begin, a pre-project meeting would be held between UDOT, all onsite workers, and the desert tortoise monitor and biologist to review all conservation measures. A handout of the conservation measures would be provided to all onsite workers.	Not applicable	Construction
Trash and food items would be contained in closed (predator-proof) containers and removed regularly as needed to reduce attractiveness to opportunistic predators such as ravens, coyotes, and feral dogs.	Not applicable	Construction
Contractor personnel would not bring domestic dogs to the project site.	Not applicable	Construction
Any time a vehicle or construction equipment is parked in desert tortoise habitat, the area around and directly under the vehicle must be inspected for desert tortoises before the vehicle or equipment is moved. The inspection does not need to be performed by a desert tortoise monitor, biologist, or FCR. If a desert tortoise is observed, it would be left to move on its own – the desert tortoise would not be approached or handled. If this does not occur within 15 minutes, an approved desert tortoise biologist would be contacted to remove and relocate the animal.	Not applicable	Construction
A desert tortoise biologist would prepare all survey reports and field notes and submit them to USFWS quarterly. The desert tortoise biologist would prepare a final summary report and submit it to USFWS at project completion. The reports would describe: 1. The desert tortoise survey and monitoring activity that was completed; 2. The extent of impacts to desert tortoises, including all desert tortoise encounters within the project boundaries and how they were reported and addressed.	Not applicable	Construction
During routine inspections, scheduled maintenance, emergency maintenance, or any other maintenance, if desert tortoises are encountered, they would be avoided, and the UDWR and BLM Biologist would be contacted if there appear to be hazards to the desert tortoise. If appreciably higher than average desert tortoise mortalities are documented at a given location, UDOT (or the subsequent ROW holder) would coordinate with the UDWR or BLM. The UDWR and BLM would coordinate with the USFWS as appropriate.	Not applicable	Construction
Maintenance activities that create new surface disturbance in suitable habitat would be coordinated with the BLM. The BLM would coordinate with the USFWS as appropriate.	Not applicable	Operations and Maintenance
If emergency maintenance activities create new surface disturbance in suitable habitat or are required during the Most Active Season in suitable habitat, the BLM would be contacted within 24 hours to minimize any impacts and coordinate post-emergency response. The BLM would coordinate with the USFWS as appropriate.	Not applicable	Operations and Maintenance

Design Feature	UDOT Construction Specification (UDOT 2017)	Applicability
Protect avian species during construction activities.	Not applicable	Construction
Where possible, construction activities, including habitat-alteration and noise, would take place outside of Utah's migratory bird primary nesting season (April 1 to July 15). In Utah, the migratory bird nesting season can extend from January 1 to August 31 (especially for raptors). Therefore, a pre-construction survey by a qualified biologist (<7 to 10 days prior to when work actually begins on the project sites) would be conducted for nesting birds. The location and timing of migratory bird surveys would be coordinated with the BLM Wildlife Biologist.	Not applicable	Construction
If an active nest is identified, the BLM Wildlife Biologist would be notified, and a no activity buffer (ranging from 100 -feet to 1 mile, depending on the species) would be established around the nest site and remain in place until the young have fledged and/or the nest becomes non-active (Romin and Muck 2002, USFWS 2014).	Not applicable	Construction
Activities would comply with Utah BLM BMPs for Raptors and Their Associated Habitats in Utah (BLM 2006). Project activities would not occur within recommended spatial and seasonal buffers for raptors, unless otherwise approved by the BLM. If existing topography limits line-of-sight between an active nest and construction activities, spatial and seasonal buffers may be reduced.	Not applicable	Construction
Land and Water Conservation Fund.	Not applicable	Design and Construction
Although Section 7 of the LWCF makes monies available for Federal acquisition and land-management activities, it does not assign management prescriptions or limitations to any Federal lands in which LWCF funds are used for acquisition or management (54 U.S.C. 200306). In contrast, Section 6 of the LWCF generally requires that any property acquired or developed with funds under a State program cannot be converted to another use without approval from the National Park Service (54 U.S.C. § 200305(f)(3); see also 36 CFR § 59.3). In contrast to Alternative 5, the roadway design under Alternatives 2, 3, and 4 does not impact any parcels acquired through the State LWCF program, and accordingly would not require a Section 6(f) approval. In development of the roadway design included in the Final POD, UDOT will make reasonable efforts using construction techniques and technology or equipment available at the time of roadway construction and reasonable feasibility, including economic feasibility, to incorporate such technology into the project design as may be reasonably appropriate to comply with any specific requirements applicable to impacted LWCF parcels, such as avoiding any encumbrance that would be inconsistent with the purposes of the conservation easement acquired by BLM under UTU-79246.	Not applicable	Design and Construction

D.2 Mitigation Measures and Conditions of Approval

Mitigation measures and conditions of approval are specific BLM requirements for a Notice to Proceed (NTP) with construction to be issued. As discussed in EIS Section 2.2.9.2, two of these mitigation measures were identified by the BLM in coordination with the USFWS as required for mitigating potential impacts on Mojave desert tortoise. The USFWS documentation outlining those mitigation measures are included in this appendix as follows:

- Attachment 1: Shade structures for desert tortoise exclusion fence: design guidance
- Attachment 2: Passages for connectivity of Mojave desert tortoise populations across fenced roads

D.3 Conservation Measures in the Proposed Reserve Zone 6

As discussed in EIS Section 2.5, the BLM would implement conservation measures for special status plants on BLM-administered lands in the proposed Reserve Zone 6 if Reserve Zone 6 is established. The establishment of Reserve Zone 6 would occur if the USFWS issues the ITP to Washington County and the BLM approves a ROW in Reserve Zone 3. The documentation outlining those conservation measures are included in this appendix as follows:

- Attachment 3: General listed plant conservation measures provided for proposed Reserve Zone 6

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Attachment 1: Shade Structures for Desert Tortoise Exclusion Fence: Design Guidance

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Shade Structures for Desert Tortoise Exclusion Fence: Design Guidance

U.S FISH AND WILDLIFE SERVICE

SEPTEMBER 2018

This U.S. Fish and Wildlife Service guidance document is intended to inform the design and construction of shade structures for projects that implement desert tortoise exclusion fence as a protective measure. Shade structures should be placed at regular intervals along fence line to provide shade for desert tortoises that pace the fence line in order to allow cooling and prevent hyperthermia. While there may not be a singular *correct* way to construct a shade structure, we advise that there are certainly designs that can range anywhere from being ineffective to potentially lethal. The following are considerations to be made when constructing and placing shade structures along fence lines:

1) A shade structure could consist of any material, but PVC pipe is overall the most durable. Schedule 80 PVC has a thicker wall diameter than schedule 40 PVC, and would be the best option for long-term, durable shade structures. However, it may be cost prohibitive for many projects. Schedule 40 PVC is less expensive and would not provide as much resistance to weight placed on top of the structure, however it is most likely adequate for many applications. We recommend against using cardboard concrete forming tubes or similar materials for long-term application, as these are unlikely to maintain structural integrity in harsh environmental conditions (e.g., rainfall). However, such materials may be adequate for short-term use depending on the overall purpose and need.
2) The interior diameter of the shade structure should be at minimum 12-15" in order to allow large desert tortoises to rotate within the structure and to prevent them from becoming trapped inside the shelter.
3) We recommend the length of each shade structure to be at minimum 6 feet. Shade structures that are too short may not provide adequate shade throughout the day as the sun moves from east to west. Each structure should also be able to accommodate more than one desert tortoise.
4) Shade structures should be spaced at minimum 1,000 feet apart, and placed directly against the exclusion fence. The appropriate distance between structures could vary depending on considerations such as the number of desert tortoises that have been moved to the outside of the exclusion fence and existing shelter (e.g., vegetation) along the fence line.

5) Shade structures should be covered with 3-4 inches of soil and rocks. The soil insulates the interior of the structure and prevents it from radiating too much heat inward, and rocks help keep the soil in place on top of the structure. Inward radiative heat caused by an uninsulated structure (particularly PVC pipe) may increase the risk of hyperthermia to a desert tortoise within the structure. While beneficial to the effectiveness of an individual structure, care should be taken to not pile soil and rocks too high on top of a structure; if too high and close to the top of the exclusion fence this may enable a desert tortoise to climb to the top of the structure and climb over the fence.
6) Shade structures require routine maintenance to keep clear of debris, particularly following precipitation events. They may also fill up over time with debris such as growing vegetation, windblown sediment, rocks, etc. Structures should have two openings (i.e., open on each end) to enable a desert tortoise to escape if one end becomes obstructed by debris.
7) Monitoring of a fence line and shade structures should be conducted regularly when temperatures are high enough to raise a tortoise's body temperature above the critical maximum (critical maximum=103-112 degrees Fahrenheit). Keep in mind that ambient temperatures do not need to be this high to cause a tortoise's body temperature to exceed critical maximum. We recommend regular monitoring when temperatures are approaching and exceed 95 degrees Fahrenheit, with the 1-2 hours immediately before and after this threshold being the most critical.
8) Monitoring of a fence line and shade structures should be conducted after all precipitation events that result in sediment runoff. Such events can obstruct one or both openings of a shade structure, potentially leading to entrapment of a desert tortoise within a structure.
9) When monitoring a shade structure, keep in mind that many different species of wildlife may be present within the shelter. These may include snakes, owls, birds, rabbits, rodents, ringtailed cats, badgers, and foxes. Caution should be taken when approaching and reaching into a structure to remove debris.

The following photos illustrate what we consider to be a range in effectiveness of shade structures:

Photo 1: Schedule 80 PVC pipe, 6-feet in length, 3-4 inches of soil/rocks on top to insulate the structure. This is an example of an effective and durable structure.

Photo 2: Cardboard concrete forming tube, approximately 2-feet in length, no soil/rocks on top of structure. This is an example of a structure that may be adequate for short-term use but would not be appropriate for long-term use. Cardboard is not durable in harsh environmental conditions, and if the structure collapsed during or after rainfall the cinder blocks could potentially trap small desert tortoises. Cardboard may, however, produce less radiative heat than PVC. The structure may also be too short to provide adequate cover for multiple animals or individual animals throughout a day.

Photo 3: Schedule 80 PVC pipe, approximately 18 inches in length, no soil/rocks on top of structure. This is an example of a structure that is poorly constructed and could potentially be lethal to desert tortoises. Without adequate soil/rock insulation on top, radiative heat could be detrimental to desert tortoises inside the structure. The structure may also be too short to provide adequate cover for multiple animals or individual animals throughout a day.

We emphasize that these recommendations are meant to be general guidance when constructing and placing shade structurers along desert tortoise exclusion fence. Please contact the appropriate U.S. Fish and Wildlife Field Office with questions about the design and placement of shade structures:

For California projects:
Palm Springs Fish and Wildlife Office
760.322.2070

For Nevada projects:
Southern Nevada Fish and Wildlife Office
702.515.5450

For Utah projects:
Utah Ecological Services Office
801.975.3330

For Arizona projects:
Arizona Ecological Services Office
928.556.2106

Recommended Citation: U.S. Fish and Wildlife Service. 2018. Shade Structures for Desert Tortoise Exclusion Fence: Design Guidance. U.S. Fish and Wildlife Service, Palm Springs, California.

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Attachment 2: Passages for Connectivity of Mojave Desert Tortoise Populations Across Fenced Roads

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PASSAGES FOR CONNECTIVITY OF MOJAVE DESERT TORTOISE POPULATIONS ACROSS FENCED ROADS

March 27, 2014

Recommendations

1. Desert tortoise exclusion fencing should be strongly considered for roads with an average daily traffic volume over 200.
2. Passages associated with desert tortoise road fencing spaced 670 meters apart have the potential to restore adult connectivity to pre-road conditions[1].
3. Passages should be placed as close to the 670 m spacing as possible, especially where roads bisect occupied tortoise habitat. Passages should not be created in areas of extremely low habitat potential or where one side of the road is no longer habitable by tortoises.
4. Flexibility of spacing should accommodate placement of passages in association with washes where possible, because tortoises preferentially use washes for foraging and movement.
5. Culverts or other under-road passages should have an openness ratio (the structure's cross-section/length) of 0.4.
6. Regular maintenance should be performed as necessary to maintain road fencing and open corridors for tortoise movement, especially after storm events where fencing is damaged and debris blocks narrow passages.
7. Additional research is necessary to investigate the effects of roads and passages on desert tortoise genetics, demography, and population connectivity. It will also be helpful to conduct additional research on optimal design criteria (*e.g.*, width, height, placement) to ensure maximum use of passages.
8. Although culverts have been the primary type of wildlife passage used throughout the range of the Mojave desert tortoise, other forms of passage should be explored to encourage wildlife (tortoise) use.

In an unobstructed desert landscape, home ranges of individual tortoises overlap such that breeding and other types of social interactions occur (Harless *et al*. 2009), maintaining genetic and demographic connectivity among individuals and populations. However, depauperate desert tortoise populations have been observed along highways (LaRue 1993; Boarman *et al.* 1997), thereby reducing population connectivity across the road. Abundance of tortoise sign decreases closer to unfenced roadways (LaRue 1993; Hoff and Marlow 2002), resulting in a zone of population depletion of up to 2 miles from highways with the highest traffic volumes (Nicholson 1978; Karl 1989; Hoff and Marlow 2002; Boarman and Sazaki 2006). For animals like tortoises, long-lived and with low reproductive rates, negative population effects of roads can be particularly pronounced (Rytwinski and Fahrig 2012).

[1] The role of juvenile tortoise movements in connectivity is important to consider, but existing information did not allow for specific inclusion in these recommendations.

Fences reduce road mortality of desert tortoises and other wildlife species (Boarman *et al.* 1997) and facilitate successful reoccupation of habitat adjacent to roadways (Boarman 2009, USFWS, unpubl. data). Desert tortoise exclusion fencing (USFWS 2009) should be strongly considered for roads with an average daily traffic volume over 200 (based on results of Hoff and Marlow [2002] and Nafus *et al.* [2013]). However, fences do not alleviate the fragmenting effects of roads. Populations of tortoises are known to be at historically low densities (USFWS 2011) so that isolation due to roads increases susceptibility of populations to demographic and environmental stochasticity (Boarman *et al.* 1997; Boarman and Sazaki 1996, 2006; Forman and Alexander 1998; Trombulak and Frissell 2000; Latch *et al.* 2011). There are few data to evaluate the design and effectiveness of passages at minimizing the fragmenting effects of roads. Ultimate effectiveness would occur by restoring connections between tortoises whose home ranges would have overlapped if the road was not there. When encountering a physical barrier such as a fence, tortoises will follow the barrier for great distances, presumably to find a way around it (Fusari 1982; Ruby *et al.* 1994). Exclusion fencing interrupted by safe passages therefore has the potential to reduce animal-vehicle collisions and maintain landscape connectivity (Boarman *et al.* 1997).

To restore historical (*i.e.*, pre-road) connectivity potential, passages should be spaced approximately one home range apart so that tortoises living along the road have access to at least one road passage. Annual or seasonal home ranges for adult Mojave desert tortoises are 10 and 26 hectares for females and males respectively, estimated as averages across the set of studies described in Table 3 of Harless *et al.* (2010). However, guidelines for providing opportunities for demographic and genetic exchange may be based more practically on a multi-year home range estimate than a single-year estimate. Home ranges based on several years incorporate inter-annual variation in space use and reflect greater use of an area and greater potential overlap of home ranges by individual tortoises; basing recommendations for passage spacing on longer, lifetime (*i.e.*, 60+ years) home ranges could underestimate effects of routine, pre-road interactions. Moderate-term movement data ($\geq$4 years) from Joshua Tree National Park produced average home range estimates of 43 and 44 hectares for adult female and male tortoises, respectively (Vamstad *et al.* 2013). Therefore, we use a multi-year home range estimate of 45 hectares on which to base ideal passage-spacing recommendations, subject to change based on future data and research.

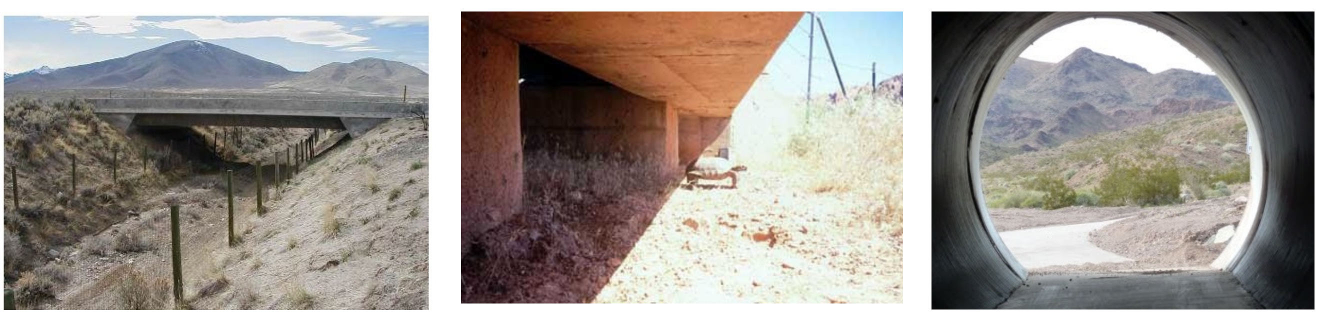
Home ranges depicted as abutting 45-hectare squares would be 670 meters on a side. This home range size was generated in relatively high-density tortoise habitat, which is also where more tortoises and more tortoise interactions would be disrupted by road construction; thus, where high-potential tortoise habitat exists on both sides of a road, passages should be closer to this ideal to restore pre-road levels of connectivity, with wider spacing in areas of lower habitat potential (see Nussear *et al.* 2009 for estimation of habitat potential). Passages should not be created in areas of extremely low habitat potential or where one side of the road is no longer habitable by tortoises. These determinations should be made by USFWS biologists for each project.

The spacing recommendations above address *physical barriers* to movement across a fenced road. In addition, most wildlife, including tortoises, have demonstrated through their aversion to using suboptimal passages that *behavioral obstacles* also exist (Lesbarrères and Fahrig 2012). Physical as well as behavioral obstacles to movement must be overcome to restore connectivity. Desert tortoises have been documented to use storm-drain culverts to cross beneath fenced highways (Boarman *et al.* 1998). Culvert substrate (*e.g.*, sand, silt, gravel) has been shown to determine whether a tortoise uses the culvert as a passage (Foreman 2003). Examples of attempts to improve passability over rough substrate are found on the Federal Highway Administration's website:

http://www.fhwa.dot.gov/environment/wildlife_protection/index.cfm?fuseaction=home.viewArticle&articleID=110

http://www.fhwa.dot.gov/environment/wildlife_protection/index.cfm?fuseaction=home.viewArticle&articleID=138.

Cement box culverts rather than corrugated metal culverts are preferred because they hold the appropriate substrate conducive to tortoise passage (Boarman pers. comm. in McLuckie *et al.* 2004). Because tortoises preferentially use desert washes for foraging and movement (Jennings 1993), placement of passages in washes may facilitate tortoises using passages in those areas. The ability of tortoises to see light is an issue for whether they will use a tunnel, but exact thresholds are unknown; experience has shown that tortoises will generally use tunnels less than 100 feet long on their own (Caltrans Division of Research and Innovation 2012). In general, shorter culverts of a larger diameter are preferred (Arizona Interagency Desert Tortoise Team 2008), and an "openness ratio" – the structure's cross-section/length – of 0.4 has been recommended for medium-sized animals (Meese *et al.* 2007). Figure 1 illustrates examples of various passages.



Meese et al. (2007) Ann McLuckie River Mts, Kevin Purdy: Every Trail website

Figure 1. Examples of road passages. For a typical 4-lane interstate (86 ft wide), square passages should be at least 5.9 ft on a side and circular passages should be at least 6.6 ft in diameter to achieve an openness ratio of 0.4.

Although lighting may entice a tortoise to use the passage, noise and visual cues from passing vehicles have been shown to discourage movement by tortoises (Ruby *et al.* 1994). Other wildlife also have been observed to avoid entering passages in situations with high traffic volume, so recommendations have been made that sound-attenuating walls be placed above the entrance to reduce noise and light disturbance from passing vehicles (Tewes and Hughes 2001). Passages should be designed so that flooding does not lead to blockage with debris, and in particular so that there is sufficient unwetted width clear of debris to encourage use by desert tortoises (Ruediger 2001; Lovich *et al.* 2011; Lesbarrères and Fahrig 2012). Maintenance should be performed as necessary to ensure passageways for tortoise movement. If an existing drainage culvert is so small as to be an entrapment hazard to tortoises, it does not contribute to connectivity potential and should be blocked with wire mesh (Lovich *et al.* 2011). Additionally, erosion below the ends of a passage can result in the passage becoming inaccessible to tortoises. Designs that minimize erosion potential are preferred, and issues should be corrected as they arise.

While we predict that implementation of these recommendations will strongly alleviate population-level impacts to connectivity while eliminating tortoise mortality on roads, the recommendations should be implemented through a process of adaptive management. Uncertainties surround the effectiveness of our specific quantitative recommendations and the ultimate effects of passage engineering and spacing on desert tortoise population genetics and demographic connectivity. Effective monitoring should occur in coordination with the installation of passages. Sites with existing data on tortoise populations surrounding a road and/or sites with ongoing monitoring already in place may provide important opportunities to refine recommendations and answer key questions. Is tortoise mortality negligible, or otherwise unimportant at the population level, along unfenced roadways with average daily traffic volumes less than 200? Does incorporation of passages at 670-meter intervals alleviate population-level effects of fragmentation; does a larger interval accomplish the same goal? Is the 670-meter interval appropriate when juvenile tortoise movements and contribution to connectivity are considered in the broader context of processes that maintain a population's viability? To what extent does an openness ratio of 0.4 (or other value) and other design features facilitate tortoise use of under-road passages? Answers to these questions will allow recommendations to be refined to meet the objective of maintaining ecologically relevant connectivity of desert tortoise populations.

Although our recommendations for passage spacing are based on ensuring that as many tortoises living along roads as possible can encounter a passage across the road, effectiveness of these passages will also depend on the willingness of tortoises to cross through them. Designs other than modified drainage culverts, such as open-span, extended stream crossings or bridges over larger washes, may be more effective at providing passage opportunities for tortoises as well as other Mojave Desert species (Lesbarrères and Fahrig 2012). Movement considered in the current recommendations may be important for accessing resources throughout different parts of a tortoise's home range, mate-searching by adults, or dispersal by smaller tortoises, but there is no information on how passage spacing may affect these movements differently. In general, we have no information on whether the constraint of movement for tortoises that live near fencing affects their survival and reproductive success. Research on any of these topics may inform us not only about effects of roads, fencing, and various passage types, but also about minimizing fragmentation effects of transmission and other infrastructure corridors.

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Attachment 3: General Listed Plant Conservation Measures Provided for Proposed Reserve Zone 6

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General Listed Plant Conservation Measures Provided for Proposed Reserve Zone 6

The following recommendations provide avoidance and minimization conservation measures for the Northern Corridor project across the Red Cliffs National Conservation Area (NCA) and encompassing Red Cliffs Desert Reserve. The recommendations will apply to Proposed Reserve Zone 6, a proposed 6,800-acre mitigation area outside the Reserve and Red Cliffs NCA. For the purposes of these recommendations, potential, suitable, and occupied habitat are defined as follows:

- *Potential habitat* is defined as areas that satisfy the broad criteria of the species habitat description, and are usually determined by preliminary, in-house assessment.
- *Suitable habitat* is defined as areas that contain or exhibit the specific components or constituents necessary for plant persistence; it is determined by field inspection and/or surveys. Suitable habitat may or may not contain federally listed plant species; habitat descriptions can be found in Federal Register notices and the species recovery plan links at https://ecos.fws.gov/ecp/.
- *Occupied habitat* is defined as areas currently or historically known to support the species and is synonymous with "known habitat."

Current avoidance and minimization measures include the following:

1) Pre-project habitat assessments will be completed across 100 percent of the project disturbance area within potential habitat prior to any ground-disturbing activities to determine if suitable habitat is present.
2) Surveys will be conducted within suitable habitat to determine occupancy, as follows:
   a) Must be conducted by qualified individual(s) and according to Bureau of Land Management (BLM) and U.S. Fish and Wildlife Service (USFWS) -accepted survey protocols.
   b) Will be conducted in suitable and occupied habitat for all areas proposed for surface disturbance prior to initiation of project activities and within the same growing season, at a time when the plant can be detected (usually the flowering period). However, surveyors should verify that the plant is flowering by contacting a BLM or USFWS botanist or demonstrating that the nearest known population is in flower.
   c) Will occur within 300 feet from the edge of the proposed right-of-way (ROW) and/or project disturbance for surface pipelines, roads, well pads, and other facilities requiring removal of vegetation.
   d) Will include, but not be limited to, plant species lists and habitat characteristics.
   e) Will be valid until the beginning of the flowering period the following year.
   f) Will be combined with historic plant location data for that particular site to delineate the outer boundary of occupied habitat. The 300-foot avoidance buffer will then be applied to the outer boundary of occupied habitat for that site. This evaluation will occur in coordination with the BLM and USFWS to ensure that the appropriate buffer is applied to protect active and dormant plants and dormant seed banks in occupied habitat.
   g) Reports (electronically submitted) and GIS shape files will be sent no later than December 31 to each of the following:
      - Utah or Arizona Natural Heritage Program (NHP; with copies of NHP field survey forms);
      - Applicable/affected land owners and/or management agencies; and

  - Appropriate BLM and USFWS field offices.

3) Where standard surveys are technically infeasible and otherwise hazardous due to topography, slope, or other factors, suitable habitat will be assessed and mapped for avoidance (hereafter, "avoidance areas") and incorporate 300-foot buffers. However, site-specific distances will need to be approved by the USFWS and BLM when disturbance will occur up-slope of habitat.

4) Project infrastructure will be designed to minimize impacts within suitable habitat, as follows:

   a) Limit new access routes created by the project.

   b) Roads and utilities should share common ROWs where possible.

   c) Reduce the width of ROWs and minimize the depth of excavation needed for the road bed; where feasible, use the natural ground surface for the road within habitat.

   d) Place signing to limit off-road travel in sensitive areas.

   e) Stay on designated routes and other cleared/approved areas.

   f) Noxious weeds within occupied habitat on all federal lands may be controlled with herbicides, in accordance with the 2007 BLM Herbicide PEIS Guidelines (http://www.blm.gov/wo/st/en/prog/more/veg_eis.html) and 2016 BLM Invasive Weed Management Plan Environmental Assessment, or most recent Kanab Field Office guidance.

      - A Pesticide Use Permit (PUP) will be approved through the action agency prior to weed control activities in occupied habitat. An approved PUP will include the most recent BLM guidelines for herbicide use near sensitive plant species.

   g) Erosion control measures (e.g., silt fencing) will be implemented to minimize sedimentation or concentrating water flow toward federally listed plants and populations located down slope of proposed surface disturbance activities. Such measures should only be installed within the area proposed for disturbance.

   h) Only water (i.e., no chemicals, brine, or produced water) will be used for dust abatement measures.

   i) All disturbed areas will be revegetated with native species comprised of species indigenous to the area. Non-native species may be included in a seed mix provided that the selected species are sterile, non-rhizomatous, and unlikely to invade other areas. Seed mix should be approved by BLM botanists and the USFWS.

5) Within occupied habitat, project infrastructure will be designed to avoid direct disturbance and minimize indirect impacts to populations and to individual plants, as follows:

   a) Follow the above recommendations for project design within suitable habitats.

   b) Buffers of 300 feet minimum will be maintained between the edge of disturbance and plants, populations, occupied habitat, and avoidance areas.

   c) To avoid water flow and/or sedimentation into occupied habitat and avoidance areas, silt fences, hay bales, and similar structures or practices will be incorporated into the project design; appropriate placement of fill is encouraged.

   d) Construction activities will not occur during the flowering period within occupied habitat.

   e) Roads will be graveled within 300 feet of occupied habitat.

   f) Dust abatement measures will be applied to disturbed areas during the active growing period (typically April 1 through July 31) and throughout the lifetime of the project (i.e., from initial construction through reclamation).

   g) Before and during construction, areas for avoidance should be visually identifiable in the field (e.g., flagging, temporary fencing, rebar, and similar).

h) Produced oil, water, or condensate tanks will be placed in centralized locations, away from occupied habitat.

i) Project-related vehicle travel on dirt roads will obey a 15-mile-per-hour speed limit to reduce dust during the time of the year when the species, pollinators, and associated habitat are most vulnerable to dust-related impacts, during the flowering period.

- Speed limit signs will be posted for project personnel.
- A qualified botanist will be onsite during any ground-disturbing activity to monitor surface disturbance activities and assist with implementation of applicable conservation measures.

6) Occupied habitat within 300 feet of the edge of the pipelines ROWs, road ROWs, and associated facilities will be monitored for a period of 3 years after ground-disturbing activities. Monitoring will include annual plant surveys to determine plant and habitat impacts relative to project facilities. Annual reports shall be provided to BLM and the USFWS. To ensure desired results are being achieved, minimization measures will be evaluated and may be changed after a thorough review of the monitoring results and annual reports during annual meetings between BLM and the USFWS.

7) Re-initiation of Section 7 consultation with the USFWS will be sought immediately if any loss of plants or occupied habitat for the federally listed plants is anticipated as a result of project activities.

Additional site-specific measures may also be employed to avoid or minimize effects to the species. These additional measures will be developed and implemented in consultation with the USFWS to ensure continued compliance with the Endangered Species Act.

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Appendix E: Ecological Systems (Vegetation Communities) within the Mojave Desert Tortoise Analysis Area

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Appendix E. Ecological Systems (Vegetation Communities) within the Mojave Desert Tortoise Analysis Area

This table represents the Existing Vegetation Types mapped by the shared U.S. Department of Agriculture Forest Service and U.S. Department of the Interior Landscape Fire and Resource Management Planning Tools (LANDFIRE) program that are within the boundaries of the Mojave Desert Tortoise Analysis Area for the Northern Corridor Project. The Mojave Desert Tortoise Analysis Area includes all modeled Mojave desert tortoise habitat within the Habitat Conservation Plan Permit Area. The Existing Vegetation Types were grouped, predominantly by physiognomy, for mapping and analysis purposes within the Draft Environmental Impact Statement. Existing Vegetation Types that make up less than 1 percent of the total Mojave Desert Tortoise Analysis Area were lumped together into the Subdominant group on the maps.

Existing Vegetation Types	Physiognomy	EIS Group	Acres
Colorado Plateau Blackbrush-Mormon-tea Shrubland	Shrubland	Shrubland	11,414.5
Colorado Plateau Mixed Bedrock Canyon and Tableland	Sparsely Vegetated	Sparsely Vegetated	1,234.2
Colorado Plateau Mixed Low Sagebrush Shrubland	Shrubland	Sagebrush	4.8
Colorado Plateau Pinyon-Juniper Shrubland	Shrubland	Pinyon-Juniper	6.6
Colorado Plateau Pinyon-Juniper Woodland	Conifer	Pinyon-Juniper	630.2
Developed-High Intensity	Developed-High Intensity	Developed	1.1
Developed-Low Intensity	Developed-Low Intensity	Developed	46.0
Developed-Medium Intensity	Developed-Medium Intensity	Developed	5.3
Developed-Roads	Developed-Roads	Developed	47.4
Great Basin and Intermountain Introduced Annual and Biennial Forbland	Exotic Herbaceous	Exotic Invasives	169.7
Great Basin and Intermountain Introduced Annual Grassland	Exotic Herbaceous	Exotic Invasives	4,348.3
Great Basin and Intermountain Introduced Perennial Grassland and Forbland	Exotic Herbaceous	Exotic Invasives	200.5
Great Basin and Intermountain Ruderal Shrubland	Exotic Tree-Shrub	Exotic Invasives	19,663.2
Great Basin Foothill and Lower Montane Riparian Herbaceous	Riparian [a]	Riparian	0.2
Great Basin Foothill and Lower Montane Riparian Shrubland	Riparian [a]	Riparian	27.9
Great Basin Foothill and Lower Montane Riparian Woodland	Riparian	Riparian	39.9
Great Basin Pinyon-Juniper Woodland	Conifer	Pinyon-Juniper	9,351.2
Great Basin Semi-Desert Chaparral	Shrubland	Chaparral	1,175.7

Existing Vegetation Types	Physiognomy	EIS Group	Acres
Great Basin Xeric Mixed Sagebrush Shrubland	Shrubland	Sagebrush	62.1
Interior West Ruderal Riparian Forest	Exotic Tree-Shrub	Riparian	165.3
Interior West Ruderal Riparian Scrub	Riparian [a]	Riparian	275.6
Interior Western North American Temperate Ruderal Grassland	Riparian [a]	Exotic Invasives	17.4
Interior Western North American Temperate Ruderal Shrubland	Exotic Tree-Shrub	Exotic Invasives	32.1
Inter-Mountain Basins Active and Stabilized Dune	Sparsely Vegetated	Sparsely Vegetated	3.1
Inter-Mountain Basins Big Sagebrush Shrubland	Shrubland	Sagebrush	7,223.4
Inter-Mountain Basins Big Sagebrush Steppe	Shrubland	Sagebrush	0.2
Inter-Mountain Basins Cliff and Canyon	Sparsely Vegetated	Sparsely Vegetated	93.5
Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	Conifer	Conifer	4.5
Inter-Mountain Basins Greasewood Flat	Shrubland	Shrubland	103.8
Inter-Mountain Basins Juniper Savanna	Conifer	Conifer	0.2
Inter-Mountain Basins Mixed Salt Desert Scrub	Shrubland	Salt Desert Scrub	867.5
Inter-Mountain Basins Montane Sagebrush Steppe	Shrubland	Sagebrush	21.9
Inter-Mountain Basins Semi-Desert Grassland	Grassland	Grassland	259.6
Inter-Mountain Basins Semi-Desert Shrub-Steppe	Shrubland	Desert Scrub	3,948.4
Inter-Mountain Basins Shale Badland	Sparsely Vegetated	Sparsely Vegetated	408.4
Inter-Mountain Basins Volcanic Rock and Cinder Land	Sparsely Vegetated	Sparsely Vegetated	46.0
Inter-Mountain Basins Wash	Sparsely Vegetated	Wash	0.2
Mogollon Chaparral	Shrubland	Chaparral	479.9
Mojave Mid-Elevation Mixed Desert Scrub	Shrubland	Desert Scrub	102,752.4
North American Arid West Emergent Marsh	Riparian	Wetland	20.8
North American Warm Desert Badland	Sparsely Vegetated	Sparsely Vegetated	2.9
North American Warm Desert Bedrock Cliff and Outcrop	Sparsely Vegetated	Sparsely Vegetated	242.1
North American Warm Desert Cienega	Riparian	Wetland	40.9
North American Warm Desert Lower Montane Riparian Shrubland	Riparian [a]	Riparian	0.8
North American Warm Desert Lower Montane Riparian Woodland	Riparian	Riparian	2.2

Existing Vegetation Types	Physiognomy	EIS Group	Acres
North American Warm Desert Pavement	Sparsely Vegetated	Sparsely Vegetated	360.0
North American Warm Desert Playa	Sparsely Vegetated	Sparsely Vegetated	23.5
North American Warm Desert Riparian Herbaceous	Riparian [a]	Riparian	23.0
North American Warm Desert Riparian Mesquite Bosque Shrubland	Riparian [a]	Riparian	2.4
North American Warm Desert Riparian Mesquite Bosque Woodland	Riparian	Riparian	2.9
North American Warm Desert Riparian Shrubland	Riparian [a]	Riparian	38.7
North American Warm Desert Riparian Woodland	Riparian	Riparian	157.8
North American Warm Desert Ruderal and Planted Grassland	Invasives	Exotic Invasives	302.2
North American Warm Desert Ruderal and Planted Scrub	Shrubland	Exotic Invasives	9,736.1
North American Warm Desert Volcanic Rockland	Sparsely Vegetated	Sparsely Vegetated	12.7
North American Warm Desert Wash Shrubland	Wash [a]	Wash	6.4
North American Warm Desert Wash Woodland	Riparian	Riparian	0.2
Open Water	Open Water	Open Water	307.6
Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	Quarry	132.4
Recently Burned-Herb and Grass Cover	Grassland	Burned	8.3
Recently Burned-Shrub Cover	Shrubland	Burned	177.7
Recently Burned-Tree Cover	Conifer	Burned	12.0
Recently Disturbed Other-Herb and Grass Cover	Grassland	Grassland	0.6
Rocky Mountain Cliff Canyon and Massive Bedrock	Sparsely Vegetated	Sparsely Vegetated	7.5
Rocky Mountain Gambel Oak-Mixed Montane Shrubland	Shrubland	Shrubland	138.7
Rocky Mountain Lower Montane-Foothill Riparian Woodland	Riparian	Riparian	56.6
Rocky Mountain Lower Montane-Foothill Shrubland	Shrubland	Shrubland	16.7
Rocky Mountain Subalpine-Montane Mesic Meadow	Grassland	Wetland	0.2

Existing Vegetation Types	Physiognomy	EIS Group	Acres
Sonora-Mojave Creosotebush-White Bursage Desert Scrub	Shrubland	Desert Scrub	55,242.0
Sonora-Mojave Mixed Salt Desert Scrub	Shrubland	Salt Desert Scrub	335.8
Sonora-Mojave Semi-Desert Chaparral	Shrubland	Chaparral	2,864.3
Southern Colorado Plateau Sand Shrubland	Shrubland	Shrubland	926.7
Western Cool Temperate Close Grown Crop	Agricultural	Agriculture	41.1
Western Cool Temperate Developed Ruderal Evergreen Forest	Developed	Developed	2.4
Western Cool Temperate Developed Ruderal Grassland	Developed	Developed	1.6
Western Cool Temperate Developed Ruderal Herbaceous Wetland	Developed	Developed	1.2
Western Cool Temperate Developed Ruderal Mixed Forested Wetland	Developed	Developed	2.5
Western Cool Temperate Developed Ruderal Shrub Wetland	Developed	Developed	5.3
Western Cool Temperate Developed Ruderal Shrubland	Developed	Developed	68.6
Western Cool Temperate Fallow/Idle Cropland	Agricultural	Agriculture	0.1
Western Cool Temperate Pasture and Hayland	Agricultural	Agriculture	340.4
Western Cool Temperate Row Crop	Agricultural	Agriculture	0.5
Western Cool Temperate Urban Deciduous Forest	Developed	Developed	12.6
Western Cool Temperate Urban Evergreen Forest	Developed	Developed	22.6
Western Cool Temperate Urban Herbaceous	Developed	Developed	28.8
Western Cool Temperate Urban Mixed Forest	Developed	Developed	2.3
Western Cool Temperate Urban Shrubland	Developed	Developed	111.0
Western North American Ruderal Wet Meadow and Marsh	Wetland [a]	Wetland	47.8
Western North American Ruderal Wet Shrubland	Riparian	Wetland	0.7
Western Warm Temperate Close Grown Crop	Agricultural	Agriculture	78.4
Western Warm Temperate Developed Ruderal Deciduous Forested Wetland	Developed	Developed	7.2
Western Warm Temperate Developed Ruderal Evergreen Forest	Developed	Developed	58.4
Western Warm Temperate Developed Ruderal Grassland	Developed	Developed	179.2
Western Warm Temperate Developed Ruderal Herbaceous Wetland	Developed	Developed	4.4

Existing Vegetation Types	Physiognomy	EIS Group	Acres
Western Warm Temperate Developed Ruderal Mixed Forested Wetland	Developed	Developed	7.2
Western Warm Temperate Developed Ruderal Shrub Wetland	Developed	Developed	9.0
Western Warm Temperate Developed Ruderal Shrubland	Developed	Developed	3,533.3
Western Warm Temperate Fallow/Idle Cropland	Agricultural	Agriculture	3.2
Western Warm Temperate Pasture and Hayland	Agricultural	Agriculture	270.0
Western Warm Temperate Row Crop	Agricultural	Agriculture	56.2
Western Warm Temperate Urban Deciduous Forest	Developed	Developed	96.9
Western Warm Temperate Urban Evergreen Forest	Developed	Developed	15.7
Western Warm Temperate Urban Herbaceous	Developed	Developed	69.8
Western Warm Temperate Urban Mixed Forest	Developed	Developed	23.1
Western Warm Temperate Urban Shrubland	Developed	Developed	130.3

Source: NatureServe 2018, LANDFIRE Remap 2016 (updated 2019).

[a] Physiognomy was absent from the database for this existing vegetation type; physiognomy is presumed based on vegetation-type descriptions.

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Appendix F: Migratory Birds of Conservation Concern

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Appendix F. Migratory Birds of Conservation Concern

Table F-1. Migratory Birds of Conservation Concern

Species	Common	Status
Amphispiza belli	Sage sparrow	Bird of Conservation Concern, Utah Partners in Flight Priority Species
Aquila chrysaetos	Golden eagle	Bird of Conservation Concern
Athene cunicularia	Burrowing owl	Bird of Conservation Concern
Baeolophus ridgewayi	Juniper titmouse	Bird of Conservation Concern
Buteo regalis	Ferruginous hawk	Bird of Conservation Concern, Utah Partners in Flight Priority Species
Callipepla gambelii	Gambel's quail	Utah Partners in Flight Priority Species
Carpodacus cassinii	Cassin's finch	Bird of Conservation Concern
Centrocercus urophasianus	Sage-grouse	Bird of Conservation Concern, Utah Partners in Flight Priority Species
Coccyzus americanus	Yellow-billed cuckoo	Bird of Conservation Concern, Utah Partners in Flight Priority Species
Dendroica graciae	Grace's warbler	Bird of Conservation Concern
Dendroica nigrescens	Black-throated gray warbler	Utah Partners in Flight Priority Species
Empidonax traillii	Willow flycatcher	Bird of Conservation Concern
Falco mexicanus	Prairie falcon	Bird of Conservation Concern
Falco peregrinus	Peregrine falcon	Bird of Conservation Concern
Gymnorhinus cyanocephalus	Pinyon jay	Bird of Conservation Concern
Haliaeetus leucocephalus	Bald eagle	Bird of Conservation Concern
Lanius ludovicianus	Loggerhead shrike	Bird of Conservation Concern
Leiothlypus luciae	Lucy's warbler	Bird of Conservation Concern, Utah Partners in Flight Priority Species
Leucosticte atrata	Black rosy-finch	Bird of Conservation Concern
Melanerpes lewis	Lewis's woodpecker	Bird of Conservation Concern, Utah Partners in Flight Priority Species
Numenius americanus	Long-billed curlew	Bird of Conservation Concern
Oreoscoptes montanus	Sage thrasher	Bird of Conservation Concern
Pipilo aberti	Abert's towhee	Utah Partners in Flight Priority Species
Pipilo Chlorurus	Green-tailed towhee	Bird of Conservation Concern
Podiceps nigricollis	Eared grebe	Bird of Conservation Concern
Selasphorus platycercus	Broad-tailed hummingbird	Utah Partners in Flight Priority Species
Setophaga pepetechia	Yellow warbler	Bird of Conservation Concern
Spizella atrogularis	Black-chinned sparrow	Bird of Conservation Concern
Spizella breweri	Brewer's sparrow	Bird of Conservation Concern, Utah Partners in Flight Priority Species

Species	Common	Status
Toxostoma bendirei	Bendire's thrasher	Bird of Conservation Concern
Toxostoma lecontei	LeConte's thrasher	Bird of Conservation Concern
Vermivora virginiae	Virginia's warbler	Utah Partners in Flight Priority Species
Vireo bellii	Bell's vireo	Bird of Conservation Concern, Utah Partners in Flight Priority Species
Vireo vicinior	Gray vireo	Bird of Conservation Concern, Utah Partners in Flight Priority Species

Sources: Parrish et al. 2002, USFWS 2008

F.1 References

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U.S. Fish and Wildlife Service (USFWS). 2008. *Birds of Conservation Concern 2008*. United States Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. https://www.fws.gov/migratorybirds/pdf/grants/BirdsofConservationConcern2008.pdf.

Appendix G: Listed Species Considered for Analysis

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Appendix G. Endangered Species Act Listed Species Considered for Analysis

The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation decision support system was accessed on December 19, 2019, to obtain an official list of Endangered Species Act threatened, endangered, proposed, and candidate species, along with designated and proposed critical habitats potentially present in the project vicinity (USFWS 2019). Official species lists are only valid for 90 days, so an updated species list was requested on April 10, 2020 (USFWS 2020b). The species list was reviewed by a qualified biologist (Kay Nicholson, Jacobs Engineering Group Inc.) to determine if any special status species or critical habitats have the potential to occur in the action area. Table G-1 includes the official species list and identifies the potential for each species to be present in the areas affected by the proposed actions. For species potentially present but not expected to be affected by proposed actions, the justification for excluding species from further analysis follows Table G-1.

Table G-1. Endangered Species Act Listed Species that May Occur within the Area Affected by the Proposed Actions

Species	Status	Habitat Description	Potential Presence in the Area Affected by the Proposed Actions
California condor (*Gymnogyps californianus*)	Endangered, Experimental Population, Non-essential	High desert canyon lands and plateaus for nesting and open grasslands and savannahs for foraging at elevations of 2,000 to 6,500 feet.	Potentially present. Nesting and roosting habitat are not present where Habitat Conservation Plan (HCP) Covered Activities are expected, in proposed Zone 6, or in the Red Cliffs National Conservation Area (NCA). Potential foraging habitat is present in the open foothills and grasslands where HCP Covered Activities are expected, in proposed Zone 6, and in the Red Cliffs NCA. The justification for excluding this species from analysis in Chapter 3 is included following this table.
Dwarf bear-poppy (*Arctomecon humilis*)	Endangered	Mixed warm desert shrub communities with sparse vegetation and soil types of the geologic Moenkopi Formation that are gypsum-rich and highly erosive. Found at elevations of 2,700 to 3,300 feet.	Present. Occupied habitat is present in proposed Zone 6 and the Analysis Area for the HCP. Modeled suitable habitat is present in proposed Zone 6, the Analysis Area for the HCP, and Red Cliffs NCA. This species would be affected by project activities, therefore it is analyzed in detail in Chapter 3.
Gierisch mallow (*Sphaeralcea gierischii*)	Endangered, Critical Habitat present	Warm desert scrub on gypsum outcrops of the geologic Kaibab Formation. Many are found on hillsides or steep slopes.	Present. Critical habitat and modeled suitable habitat is present in the Analysis Area for the HCP. This species would be affected by project activities, therefore it is analyzed in detail in Chapter 3.

Species	Status	Habitat Description	Potential Presence in the Area Affected by the Proposed Actions
Holmgren (*Paradox*) milk-vetch (*Astragalus holmgreniorum*)	Endangered, Critical Habitat present	Associated with geological layers or parent materials found within the Moenkopi Formation. Found at elevations of 2,480 to 2,999 feet and adjacent to, or above, drainages that are tributary to the Santa Clara and Virgin Rivers. Areas with less than 15% living cover.	Present. Occupied habitat, modeled suitable habitat, and critical habitat is present in proposed Zone 6 and the Analysis Area for the HCP. This species would be affected by project activities, therefore it is analyzed in detail in Chapter 3.
Jones cycladenia (*Cycladenia humilis var. jonesii*)	Threatened	Found in mixed desert scrub, juniper, or wild buckwheat-Mormon tea vegetation communities at 4,390- to 6,000- foot elevation. Found on gypsiferous, saline soils of Cutler, Summerville, and Chinle Formations.	Not Present. This species is not currently known to occur in Washington County, therefore the proposed actions are outside the geographic range for the species. This species is excluded from further analysis.
Mexican spotted owl (*Strix occidentalis lucida*)	Threatened, Critical Habitat present	Rocky canyon habitats with branching watersheds and numerous tributary canyons, a variety of vegetation communities (ranging from arid to mesic), and prominent vertical-walled or overhanging cliffs. Protected caves or ledges on cliff faces are used for nesting and roosting. Small patches of riparian trees are also used for roosting. Foraging occurs among caves, cliff faces, and rim or canyon-bottom vegetation.	Present. HCP Covered Activities may occur near occupied nesting, roosting, and foraging habitat. This species may be affected by project activities, therefore it is analyzed in detail in Chapter 3.
Mojave desert tortoise (*Gopherus agassizii*)	Threatened, Critical Habitat present	Mojave desert scrub (north and west of the Colorado River) in basins and bajadas and rocky slopes less than 4,500 feet in elevation.	Present. This species has been detected within the vicinity of the Northern Corridor alternatives, within proposed Zone 6, and within Washington County. This species would be affected by project activities, therefore it is analyzed in detail in Chapter 3.
Shivwits milk-vetch (*Astragalus ampullarioides*)	Endangered, Critical Habitat present	Isolated pockets of purple-hued, soft clay soil found on Chinle formation around St. George, Utah. Found at 3,018 to 4,363 feet in elevation with sparse habitat (approximately 12% coverage).	Present. Occupied habitat, modeled suitable habitat, and critical habitat are present in the Red Cliffs NCA and the Analysis Area for the HCP. Modeled suitable habitat is present in proposed Zone 6. This species would be affected by project activities, therefore it is analyzed in detail in Chapter 3.

Species	Status	Habitat Description	Potential Presence in the Area Affected by the Proposed Actions
Siler pincushion cactus (*Pediocactus [Echinocactus utahia] sileri*)	Threatened	Found in Great Basin Desert shrub, Mohave desert scrub, pinyon-juniper forestlands, and grasslands on gypsiferous clay and sandy soils from the Moenkopi Formation at elevations of 2,800 to 5,400 feet.	Present. Occupied habitat and modeled suitable habitat are present in the Analysis Area for the HCP. Modeled suitable habitat is present in the Red Cliffs NCA and proposed Zone 6. This species would be affected by project activities, therefore it is analyzed in detail in Chapter 3.
Southwestern willow flycatcher (*Empidonax traillii extimus*)	Endangered, Critical Habitat present	Dense riparian woodland communities along rivers, streams, lakesides, and wetlands less than 8,500 feet in elevation. Prefers dense canopy cover, large volume of understory foliage, and surface water during mid-summer.	Unlikely to occur. Nesting and roosting habitat are not present where HCP Covered Activities are expected, in proposed Zone 6, or near any of the highway alignment alternatives in the Red Cliffs NCA. However, potential foraging habitat may be present near where HCP Covered Activities may occur. The justification for excluding this species from analysis in Chapter 3 is included following this table.
Virgin River chub (*Gila seminuda =robusta*)	Endangered, Critical Habitat present	Virgin River system of southwestern Utah, southern Nevada, and northwestern Arizona. Spawns over gravel or rock substrate. Associated with deep, protected areas of swift water.	Unlikely to occur. The Virgin River chub is a fully aquatic species. Habitat for the Virgin River chub does not overlap with desert tortoise habitat. However, Virgin River chub critical habitat includes portions of the 100-year floodplain of the Virgin River (USFWS 1995b and 2008), which could be near locations where HCP Covered Activities may occur. The justification for excluding this species from analysis in Chapter 3 is included following this table.
Woundfin (*Plagopterus argentissimus*)	Endangered, Critical Habitat present	Highly mineralized, warm streams of turbid waters. Prefers a stream speed of 1 to 2 feet per second and a depth of 8 to 18 inches. Historically occupied the lower Colorado River basin, the Virgin River, and Gila River.	Unlikely to occur. The woundfin is a fully aquatic species. Habitat for the woundfin does not overlap with desert tortoise habitat. However, woundfin critical habitat includes portions of the 100-year floodplain of the Virgin River (USFWS 1995b and 2008), which could be near locations where HCP Covered Activities may occur. The justification for excluding this species from analysis in Chapter 3 is included following this table.

Species	Status	Habitat Description	Potential Presence in the Area Affected by the Proposed Actions
Yellow-billed cuckoo (*Coccyzus americanus*), western distinct population segment	Threatened	Large contiguous patches of multi-layered riparian habitat, such as cottonwood-willow gallery forests along rivers and streams less than 6,600 feet in elevation. Commonly found in lowland riparian woodlands where Fremont cottonwood, willow, velvet ash, Arizona walnut, mesquite, and tamarisk are dominant, but also uses mesquite bosques and small stands of isolated cottonwoods intermixed with mesquite.	Unlikely to occur. The HCP Permit Area, proposed Zone 6, and the highway alignment alternatives are located within the geographic and elevational range of the species; however, suitable riparian habitat does not occur within the areas affected by the proposed actions. Potentially suitable foraging habitat may be present near where HCP Covered Activities may occur within the floodplains of the Virgin River. The justification for excluding this species from analysis in Chapter 3 is included following this table.
Yuma Ridgway's [clapper] rail (*Rallus obsoletus [=longirostris] yumanensis*)	Endangered	Variety of marshes dominated by emergent plants, including cattail, bullwhip bulrush, three-square bulrush, and sedges. Ideal habitat is a mosaic of emergent plant stands of different ages, interspersed with shallow pools of open water less than 4,500 feet in elevation.	No potential for occurrence. Marshes supporting emergent plants do not occur within or along the highway alignment alternatives, proposed Zone 6, or the HCP Permit Area. This species is excluded from further analysis.

G.1 Species Excluded from Detailed Evaluation

G.1.1 California Condor

G.1.1.1 Background and Status

The California condor (*Gymnogyps californianus*) was listed as endangered under the Endangered Species Preservation Act on March 11, 1967, and noted to occur only in California (USFWS 1967). By 1987, the last wild condor was captured and taken to the San Diego Wild Animal Park (USFWS 1996). Beginning with the first successful breeding of California condors in 1988, the population grew. In 1992, releases to the wild began, first in California, followed in 1996 in Arizona. As of April 2019, there were a total of 488 living birds, of which 312 were free-flying (188 in California, 88 in Arizona, and 36 in Mexico; AZGFD no date).

In December 1996, USFWS released California condors at the Vermilion Cliffs in northern Arizona as a designated non-essential experimental population, as provided by Section 10(j) of the Endangered Species Act (USFWS 1996), to allow regulatory flexibility. Releases have been conducted every year since. California condors from the experimental population area forage throughout the Grand Canyon of Arizona and frequently into southwestern Utah, including Washington County. Most California condor habitat use in Utah occurs in and around Zion National Park (Southwest Condor Working Group 2017), east of the Proposed Actions area. The experimental non-essential population extends north to I-15 in Washington County; foraging condors occasionally may leave the experimental population area, where there are no exemptions to the application of Endangered Species Act.

The USFWS designated final critical habitat for the California condor in 1977, including "an area of land, water, and airspace to an elevation of not less than 3,000 feet above the terrain" for several areas within California. Critical habitat is designated only in California; none exists in Utah (USFWS 1977).

G.1.1.2 Species Description, Habitat, and Range

California condors are opportunistic scavengers; food is typically found via long-distance reconnaissance flights. Telemetry data show condors cover great distances, including one flight from southern Utah to Wyoming that was more than 400 miles. Inland foraging habitat is typically composed of open terrain that supports populations of deer, elk, and cattle; condors have also been observed feeding in more wooded areas. California condors repeatedly use roosting sites on ridgelines, rocky outcrops, steep canyons, and tall trees or snags near foraging grounds (USFWS 1996). Condors require high perches from which strong updrafts provide the lift needed for flight. They are primarily a cavity-nesting species, and typically nest in cavities located on steep terrain with rock outcroppings, cliffs, and caves or in the burned-out hollows of old-growth conifers (USFWS 2013a).

Condors are most abundant in Utah from June through August (UDWR 2019). From spring through fall, condors concentrate near Zion National Park and the Kolob Plateau to the north. Suitable condor nesting habitat is present in the 10(j) non-essential population area in the finger of the Mojave Desert Tortoise Analysis Area northeast of Springdale. Condors have not been observed using habitat in the Reserve or proposed Zone 6; they have been seen in Pine Valley (north of the Reserve) a couple of times but were not observed nesting, roosting, or foraging there. Condors typically return to Arizona for the winter (USFWS 2017a) and can fly between Zion National Park and the Grand Canyon in 1 day (UDWR 2019). Nesting and roosting habitat for the condor are distinct from foraging, requiring steep slopes or cliffs or tall trees to allow for approach and landing and to become airborne again (USFWS 2013a). These habitat features do not overlap with terrain that the Mojave desert tortoise would inhabit in Washington County, and nesting or roosting birds would not be subject to disturbance from noise or human activity associated with project actions.

Condors travel widely in search of carrion. They primarily seek to scavenge on big game and other dead wildlife. The primary threat to the recovery of the species is the consumption of lead bullets from hunter-killed wildlife. Hunting on private lands in Washington County may or may not occur based on various State laws and local ordinances, regardless of HCP Covered Activities. The development of private lands allowed under the amended HCP and ITP would result in a reduction of the discharge of firearms due to the presence of people and structures. In addition, authorized development of Mojave desert tortoise habitat is primarily associated with private lands in the urban interface, though other Covered Activities are conducted across scattered parcels of State and private lands. Some areas of potential condor foraging habitat may be lost (i.e., developed) or disturbed (e.g., noise or human presence) due to HCP Covered Activities. However, consistent with condor foraging behavior, the birds would likely be attracted to on-ground activities as this often indicates a potential source of food.

G.1.1.3 Exclusion Justification

Though foraging habitat for the California condor is so extensive and feeding opportunities are widely dispersed across the landscape (USFWS 2013a), the areas where Mojave desert tortoise are found does not provide the topography, wind conditions, or density of potential big game prey to attract condors to forage in desert scrub habitats occupied by Mojave desert tortoise in Washington County. Foraging condors occasionally may leave the experimental population area. However, all free-flying birds from the experimental population are visibly marked, and the origin of birds foraging in Utah are known through patagial markings and intensive monitoring to be from the experimental non-essential population. Therefore, the conditions of the Endangered Species

Act 10(j) rule are fully applicable to these birds. Any regulations or restrictions placed on otherwise lawful activities (e.g., hunting resulting in lead consumption by condors) as a result of the presence of condors is explicitly precluded by the 10(j) rule. Foraging in desert tortoise habitat has not been documented. Furthermore, foraging habitat for California condors is abundant throughout Washington County and beyond, and California condors forage widely searching for feeding opportunities. Therefore, loss of habitat in Washington County because of HCP Covered Activities would not affect the ability of condors to forage.

When a proposed action may potentially affect the California condor 10(j) non-essential experimental population, the Bureau of Land Management has the option to conference on the species under the threshold of likely to jeopardize. Under the requirements of the National Environmental Protection Act, the 10(j) population should be addressed (and their status defined) but then are not required to be carried forward for further analysis within the National Environmental Protection Act document. The analysis area lacks all primary constituent elements of California condor habitat (USFWS 1976), and no nests, roosts, or other special use areas for condors have been identified in or anywhere near the analysis area. There is also no suitable condor foraging habitat. Therefore, it is anticipated that HCP Covered Activities would have no effect on the California condor or its critical habitat.

G.1.2 Southwestern Willow Flycatcher

G.1.2.1 Background and Status

The USFWS listed the southwestern willow flycatcher (*Empidonax trailii extimus*) as endangered under the Endangered Species Act in February 1995 (USFWS 1995a). In Utah, southwestern willow flycatchers are known only from the Virgin River riparian habitats. The Utah Division of Wildlife Resources (UDWR) has conducted surveys in the St. George, Utah, area since 2008, and has recorded occupied breeding habitat at nine sites along the Virgin River. In 2018, the UDWR observed a total of 16 nesting female flycatchers, the highest number observed since the agency surveys began (UDWR 2018). Current threats to southwestern willow flycatchers include loss of riparian habitat, alteration in stream hydrology (e.g., water withdrawal and impoundments), reservoir management, and brood parasitism by brown-headed cowbirds.

The Virgin River Resource Management and Recovery Program (also known as the Virgin River Program) conserves and monitors riparian bird species, including the southwestern willow flycatcher, in the Virgin River Basin. The Virgin River Program works to enhance riparian habitats and reduce threats to the flycatchers by reducing threats from predators and avian brood-parasites (UDNR 2002).

Washington County zoning restrictions protect aquatic and riparian habitats within the Virgin River Basin in unincorporated areas of the county by adopting zoning and ordinances that preserve open spaces within the 100-year floodplains (Washington County 2012). Local municipalities along the Virgin River (i.e., St. George, Washington City, La Verkin, and Hurricane) have each adopted zoning restrictions and ordinances that preserve open space within the 100-year floodplains (City of St. George 2002, Washington City 2017, La Verkin City 2018, City of Hurricane 2011 and 2019).

G.1.2.2 Species Description, Habitat, and Range

The southwestern willow flycatcher is one of four recognized subspecies of the willow flycatcher (USFWS 2017b). The geographic distribution for the southwestern subspecies includes southern Nevada, southern Utah, southern Colorado, southern California east to western Texas, and extreme-northwestern Mexico. Southwestern willow flycatchers are migratory, arriving in breeding territories by mid-May and then migrating to southern wintering grounds in August and September (USFWS 2002). Areas preferred for nesting include mature riparian habitat consisting of cottonwood-willow forests or salt cedar thickets along still or slow-moving watercourses at elevations that range from near sea level to 8,500 feet (USFWS 2002). Usually only one brood is produced per year.

The USFWS originally designated critical habitat for the species in 1997; after several revisions, it was most recently finalized in 2013 (USFWS 2013b). Critical habitat for the southwestern willow flycatcher includes riparian areas and stream segments, the lateral extent of which incorporates the 100-year floodplain or flood-prone areas surrounding the stream segments. A 94.4-mile critical habitat unit extends along a segment of the Virgin River beginning at Berry Springs in Hurricane, Utah, flowing southwest through Arizona and into Nevada. The Virgin River, including this segment, flows just south of St. George. The critical habitat in the permit area is located within the Virgin River Management Unit of the larger Lower Colorado Recovery Unit (USFWS 2013b).

There is predicted habitat (based on geographic information system modeling) for the southwestern willow flycatcher along riparian corridors mapped throughout the HCP Permit Area, particularly the Virgin River and the Santa Clara River north and south of the Gunlock Reservoir and its tributaries (e.g., Manganese Wash, Magotsu Creek, Moody Wash, and Pakoon Spring Wash) (Boykin et al. 2007, USGS 2007). Other predicted habitat areas include Grapevine Wash, Ash Creek, La Verkin Creek, North Creek, and tributaries to Leeds Creek (Boykin et al. 2007, USGS 2007). However, known occupied habitat is limited to the Virgin River (UDWR 2018).

G.1.2.3 Exclusion Justification

The habitats for southwestern willow flycatcher and desert tortoise generally do not overlap, because desert tortoises are not typically found in dense riparian areas. However, the southwestern willow flycatcher and desert tortoise may use similar habitats near or within the 100-year floodplains of the Virgin River Basin (USFWS 2002 and 2011).

Washington County zoning restrictions protect aquatic and riparian habitats within the Virgin River Basin in unincorporated areas of the county by adopting zoning and ordinances that preserve open spaces within the 100-year floodplains (Washington County 2012). Local municipalities along the Virgin River (i.e., St. George, Washington City, La Verkin, and Hurricane) have each adopted zoning restrictions and ordinances that preserve open space within the 100-year floodplains (City of St. George 2002, Washington City 2017, La Verkin City 2018, City of Hurricane 2011 and 2019). These zoning restrictions and ordinances, called for in the Virgin River Program, protect riparian habitats and water quality for sensitive species in the Virgin River Basin, including species that use habitat within the 100-year floodplain (UDNR 2002). Furthermore, activities that directly affect the habitat of this species also are likely to have a Federal nexus through authorizations by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act that would trigger review under Section 7 of the Endangered Species Act.

Noise, vibrations, and other construction-related activities are temporary disturbances that have the potential to affect the nesting and foraging activities of flycatchers. Noise above certain decibel levels can present a potential impact to the birds, whether from direct damage to hearing, masking of communication signals between birds, or response to predators. Studies have shown that different sound levels can produce different impacts when certain noise thresholds are exceeded, including hearing loss and permanent hearing sensitivity modifications (Dooling and Popper 2007, FHWA 2005, Delaney and Grubb 2004). However, nest sites in noisy habitats are exposed to higher levels of noise and visual disturbances, which is below the upper threshold to cause abandonment of the site but above ambient noise levels found in natural sites. HCP Covered Activities include land clearing, construction, drilling, and mining, which are activities that have potential to produce variable noise levels. Construction activities occurring near floodplains may result in noise that could cause disturbance to flycatchers. Because flycatchers are migratory, activities near nesting sites during the breeding season could disturb birds; however, application of existing ordinances and regulations protect riparian habitats within the 100-year floodplain.

Although some portions of southwestern willow flycatcher critical habitat may overlap with occupied desert tortoise habitat and modeled suitable desert tortoise habitat, especially within the Virgin River 100-year floodplain, HCP Covered Activities are not reasonably certain to cause take of flycatchers in these areas because of existing floodplain protection and the dissimilar habitat preferences of these species. Southwestern willow flycatchers and desert tortoises are unlikely to occupy the same habitat within Washington County, because desert tortoise habitat generally lacks the physical and biological features for flycatcher habitat (USFWS 2013b). In addition, the HCP Permit Area habitats used by the southwestern willow flycatcher and desert tortoise do not typically overlap (USFWS 2002 and 2011). Effects of noise from HCP Covered Activities are not reasonably certain to cause take of the southwestern willow flycatcher. Therefore, it is anticipated that HCP Covered Activities would have no effect on the southwestern willow flycatcher or its critical habitat.

No suitable or critical habitat for the southwestern willow flycatcher is present in proposed Zone 6 or within the right-of-way associated with the alternative alignments for the Northern Corridor. Therefore, it is anticipated that activities in proposed Zone 6 and the Northern Corridor would have no effect on the southwestern willow flycatcher or its critical habitat.

G.1.3 Virgin River Chub and Woundfin

The Virgin River chub (*Gila seminuda* [*robusta*]) and woundfin (*Plagopterus argentisssimus*) occupy the same habitat, so for the purposes of this document, they are discussed together.

G.1.3.1 Background and Status

The USFWS listed the Virgin River chub as endangered in August 1989 (USFWS 1989). The USFWS listed the woundfin as endangered in October 1970 (USFWS 1970) and listed an introduced Gila River population of woundfin as a non-essential experimental population in July 1985 (USFWS 1985). According to the USFWS 5-Year review report, there were more than a million woundfin in the Virgin River in the 1970s and 1980s; by 2008, there were at most 1,000 woundfin. Sampling from 2007 showed the woundfin population was "functionally extirpated" throughout its critical habitat (USFWS 2008). Since 2003, the USFWS and Virgin River Program have stocked approximately 200,000 hatchery-raised woundfin and 40,000 Virgin River chub into the Virgin River (Virgin River Program 2019a).

Threats to both species include water development projects that cause flow reductions, and non-native fish, specifically the red shiner (USFWS 2008). The Virgin River chub and woundfin have declined in numbers due to the cumulative effects of dewatering from numerous diversion projects, proliferation of non-native fishes, and alterations to natural flow, temperature, and sediment regimes (USFWS 2000).

The Virgin River Program conserves and monitors riparian and aquatic species, including the woundfin and Virgin River chub within the Virgin River Basin (see HCP Chapter 6.5). The Virgin River Program works to enhance riparian and aquatic habitats by acquiring and maintaining instream flows necessary to support aquatic species and protecting water quality through actions such as land use restrictions within the 100-year floodplain (UDNR 2002). The Virgin River Program also controls and eliminates non-native fish that compete with native fish populations, monitors habitats and populations of fishes, and develops and maintains brood stocks of fishes used to stock native habitats of the Virgin River Basin (UDNR 2002).

Washington County zoning restrictions protect aquatic and riparian habitats within the Virgin River Basin in unincorporated areas of the county by adopting zoning and ordinances that preserve open spaces within the 100-year floodplains (Washington County 2012). Local municipalities along the Virgin River (i.e., St. George, Washington City, La Verkin, and Hurricane) have each adopted zoning restrictions and ordinances that preserve open space within the 100-year floodplains (City of St. George 2002 and 2009, Washington City 2017, La Verkin City 2018, City of Hurricane 2011 and 2019).

G.1.3.2 Species Description, Habitat, and Range

The Virgin River chub is a silvery medium-sized minnow that is endemic to 134 miles of the Virgin River spanning from southwest Utah to northwest Arizona and into southeast Nevada. At the time of listing, it occurred only in a 50-mile stretch of the Virgin River between Mesquite, Nevada, and Hurricane, Utah (USFWS 1989 and 1995b). The woundfin is a small minnow that historically occurred in Arizona's Salt River and Gila River and portions of the Colorado River and the Moapa River in Nevada, but currently occurs only in the Virgin River in Utah, Arizona, and Nevada (USFWS 1995b).

Woundfin habitat includes runs and quiet water habitats with sand substrates adjacent to riffles. (USFWS 1994 and 2008). Virgin River chub habitat includes deep runs or pools associated with instream cover (USFWS 1994). Virgin River chub are longer lived than woundfin and grow to 18 inches in length, while woundfin grow to 4 inches in length (Virgin River Program 2019b).

Virgin River chub are more abundant in the upper river core area (river mile 90 to 97.5 near the confluence of Ash Creek west of Hurricane, Utah) than the lower river core area (river mile 34 to 39.5, near the Beaver Dam Wash) because red shiner and other non-native fish are absent in the upper river. The population estimated for the Virgin River chub within the upper river core (Utah) was more than 8,000 small and large fish, approximately 10 times higher than in the lower river core (i.e., Arizona and Nevada) area (USFWS 2008).

Critical habitat for the Virgin River chub and the woundfin was designated in January 2000 and encompasses 87.5 miles of the Virgin River and its 100-year floodplain in parts of Utah, Arizona, and Nevada (USFWS 2000). Critical habitat for both fish occurs within the HCP Plan Area and within the Reserve in Zones 4 and 5, where it overlaps with desert tortoise designated critical habitat (USFWS 2000).

G.1.3.3 Exclusion Justification

The Virgin River chub and woundfin both inhabit the Virgin River in Washington County (UDNR 2002). The USFWS has designated critical habitat for both species of fish within the Virgin River, including its 100-year floodplain, which supports nutrient and food resources for these species. Portions of this critical habitat overlap with desert tortoise habitat, and desert tortoise may use portions of the Virgin River 100-year floodplain for foraging. However, the aquatic habitats used by the woundfin and Virgin River chub generally do not overlap with habitats used by desert tortoise, and desert tortoise habitat generally lacks the physical and biological features (e.g., water and instream flow) of the Virgin River fish habitats (USFWS 2000).

Washington County zoning restrictions protect aquatic and riparian habitats within the Virgin River Basin in unincorporated areas of the county by adopting zoning and ordinances that preserve open spaces within the 100-year floodplains (Washington County 2012). Local municipalities along the Virgin River (i.e., St. George, Washington City, La Verkin, and Hurricane) have each adopted zoning restrictions and ordinances that preserve open space within the 100-year floodplains (City of St. George 2002 and 2009, Washington City 2017, La Verkin City 2018, City of Hurricane 2011 and 2019). These zoning restrictions and ordinances, called for in the Virgin River Program, protect riparian habitats and water quality for several sensitive species in the Virgin River Basin, including species that use habitat within the 100-year floodplain (UDNR 2002). Therefore, HCP Covered Activities are not reasonably certain to directly cause take of either Virgin River fish species.

Aquatic habitat for Virgin River chub and woundfin generally does not overlap desert tortoise habitat within the plan area, and local restrictions protect the 100-year floodplain where their habitats and critical habitats do coincide (Washington County 2012, City of St. George 2002 and 2009, Washington City 2017, La Verkin City 2018, City of Hurricane 2011 and 2019). Furthermore, activities that directly affect the habitat of these species also are likely to have a Federal nexus through authorizations by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act that would trigger review under Section 7 of the Endangered Species Act. Therefore, it is anticipated that HCP Covered Activities would have no effect to the Virgin River chub, the woundfin, or their critical habitats.

No suitable or critical habitat for the Virgin River chub or the woundfin is present in proposed Zone 6 or within the right-of-way associated with the alternative alignments for the Northern Corridor. Therefore, it is anticipated that activities in proposed Zone 6 and the Northern Corridor would have no effect on the Virgin River chub, the woundfin, or their critical habitats.

G.1.4 Yellow-Billed Cuckoo

G.1.4.1 Background and Status

The USFWS proposed the western population of the yellow-billed cuckoo (*Coccyzus americanus*) for listing in 2013 and listed the species as threatened under the Endangered Species Act in October 2014 (USFWS 2014). As of the 2013 proposed listing, there were fewer than 10 breeding pairs and likely no more than 20 pairs of cuckoos identified within the state of Utah. The decline of the yellow-billed cuckoo is a result of riparian habitat loss and degradation (USFWS 2014).

The Virgin River Program conserves and monitors riparian birds and aquatic species in the Virgin River Basin. The Virgin River Program works to enhance riparian habitats and reduce threats to the riparian species by reducing threats from predators and avian brood-parasites (UDNR 2002). Washington County zoning restrictions protect aquatic and riparian habitats within the Virgin River Basin in unincorporated areas of the county by adopting zoning and ordinances that preserve open spaces within the 100-year floodplains (Washington County 2012). Local municipalities along the Virgin River (i.e., St. George, Washington City, La Verkin, and Hurricane) have each adopted zoning restrictions and ordinances that preserve open space within the 100-year floodplains (City of St. George 2002, Washington City 2017, La Verkin City 2018, City of Hurricane 2011 and 2019).

G.1.4.2 Species Description, Habitat, and Range

The yellow-billed cuckoo is a neotropical bird that winters in South America and breeds in North America. This species is a medium-sized bird, reaching approximately 12 inches in length. Males and females are indistinguishable in the field, and the birds are secretive and difficult to detect (USFWS 2014). According to the proposed listing (USFWS 2013c), the cuckoo nests almost exclusively in low- to mid-elevation riparian woodlands that span 50 acres or more within arid to semiarid areas. Preferred cuckoo breeding habitat include a contiguous or nearly contiguous patch of woodlands within a floodplain that is at least 220 acres in extent and has both understory and overstory components (USFWS 2020a). The majority of nests are placed in willow trees, but alder, cottonwood, mesquite, walnut, box elder, sycamore, and tamarisk also are used (USFWS 2013c). Little is known about the cuckoo's migration; however, it appears they may be found in smaller riparian patches when migrating than what is typically required for nesting (USFWS 2013c). Likewise, little information is available about foraging activities, but observations indicate that cuckoos tend to forage within riparian habitat with abundant leafy vegetation (USFWS 2013c).

The USFWS proposed critical habitat that included the Virgin River on August 15, 2014 (USFWS 2014). On February 27, 2020, the USFWS issued a revised proposal that no longer included critical habitat in Washington County (USFWS 2020a). There is no proposed critical habitat located within the HCP Permit Area.

Although limited occupied habitat is known to exist within Utah, there is predicted habitat, based on geographic information system modeling, mapped throughout the permit area along riparian corridors, particularly the Virgin River, and the Santa Clara River north and south of the Gunlock Reservoir and its tributaries (e.g., Manganese Wash, Magotsu Creek, Moody Wash, and Pakoon Spring Wash) (Boykin et al. 2007, U.S. Geological Survey 2007). Other predicted habitat areas include Grapevine Wash, Ash Creek, La Verkin Creek, North Creek, and tributaries to Leeds Creek. According to the UDWR (pers. com. Day 2019), the yellow-billed cuckoo has been periodically observed in Washington County. The species has been intermittently detected along the Virgin River and the Beaver Dam Wash, and there is one known detection along the Santa Clara River. However, there are no locations with consistent sightings and no indication or evidence of breeding by the species within the St. George area (pers. com. Day 2019).

G.1.4.3 Exclusion Justification

No proposed critical habitat is present within the HCP Permit Area. Yellow-billed cuckoo nesting and foraging habitat may be present in the HCP Permit Area where larger-scale riparian areas exist within the desert tortoise's range. The habitats for yellow-billed cuckoo and desert tortoise generally do not overlap, because desert tortoises are not typically found in dense riparian areas and desert tortoise habitat lacks the physical and biological features of cuckoo habitat. However, yellow-billed cuckoos and desert tortoises may use similar habitats within the 100-year floodplains of the Virgin River Basin (USFWS 2011 and 2014).

Washington County zoning restrictions protect aquatic and riparian habitats within the Virgin River Basin in unincorporated areas of the county by adopting zoning and ordinances that preserve open spaces within the 100-year floodplains (Washington County 2012). Local municipalities along the Virgin River (i.e., St. George, Washington City, La Verkin, and Hurricane) have each adopted zoning restrictions and ordinances that preserve open space within the 100-year floodplains (City of St. George 2002, Washington City 2017, La Verkin City 2018, City of Hurricane 2011 and 2019). These zoning restrictions and ordinances, called for in the Virgin River Program, protect riparian habitats and water quality for sensitive species in the Virgin River Basin, including species that use habitat within the 100-year floodplain (UDNR 2002). Furthermore, activities that directly affect the habitat of this species also are likely to have a Federal nexus through authorizations by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act that would trigger review under Section 7 of the Endangered Species Act.

Noise, vibrations, and other construction-related activities are temporary disturbances that have the potential to affect the nesting and foraging activities of yellow-billed cuckoos. Noise above certain decibel levels can present a potential impact to the birds, whether from direct damage to hearing, masking of communication signals between birds, or response to predators. Studies have shown that different sound levels can produce different impacts when certain noise thresholds are exceeded, including hearing loss and permanent hearing sensitivity modifications (Dooling and Popper 2007, FHWA 2005, Delaney and Grubb 2004). However, nest sites in noisy habitats are exposed to higher levels of noise and visual disturbances, which is below the upper threshold to cause abandonment of the site but above ambient noise levels found in natural sites. HCP Covered Activities include land clearing, construction, drilling, and mining, which are activities that have potential to produce variable noise levels. Construction activities occurring near floodplains may result in noise that could cause disturbance to cuckoos. Because cuckoos are migratory, activities near nesting sites during the breeding season could disturb birds; however, application of existing ordinances and regulations protect riparian habitats within the 100-year floodplain.

Although some portions of yellow-billed cuckoo habitat may overlap with occupied desert tortoise habitat and modeled suitable desert tortoise habitat, especially within the 100-year floodplain, HCP Covered Activities are not reasonably certain to cause take of cuckoos in these areas due to existing floodplain protection and the dissimilar habitat preferences of these species. Yellow-billed cuckoos and desert tortoises are unlikely to occupy the same habitat within Washington County as desert tortoise habitat generally lacks suitable nesting habitat for cuckoo habitat. In addition, the HCP Permit Area habitats used by the yellow-billed cuckoo and desert tortoise do not typically overlap (USFWS 2002 and 2011). The effects of noise from HCP Covered Activities are not reasonably certain to cause take of the yellow-billed cuckoo. Therefore, it is anticipated that HCP Covered Activities would have no effect on the yellow-billed cuckoo.

No suitable or proposed critical habitat for the yellow-billed cuckoo, and no riparian habitats are present in proposed Zone 6 or within the right-of-way associated with the alternative alignments for the Northern Corridor. Therefore, it is anticipated that activities in proposed Zone 6 and the Northern Corridor would have no effect on the yellow-billed cuckoo or its proposed critical habitat.

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Appendix H: Inconsistencies between the Northern Corridor Project and the Land Use Plans, Policies, and Controls of Washington County and the City of St. George

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Appendix H. Inconsistencies Between the Northern Corridor Project and the Land Use Plans, Policies, and Controls of Washington County and the City of St. George

The National Environmental Policy Act (NEPA) requires an Environmental Impact Statement (EIS) to discuss certain factors (see 42 United States Code § 4332(2) (C)(i-v)). As set forth by NEPA's implementing regulations, one of these factors is potential conflicts between a proposed action and the objectives of Federal, regional, State and local land use plans, policies, and controls for the area concerned (40 *Code of Federal Regulations* [CFR] § 1502.16). Where an inconsistency exists between the proposed Federal action and any approved State or local plan or law, the EIS should describe the extent to which the agency would reconcile its proposed action with the plan or law.

Also related to State and local planning, 40 CFR § 1506.2(d) requires that the EIS "discuss any inconsistency of a proposed action with any approved State or local plan and laws," and if an inconsistency exists, describe "the extent to which the agency would reconcile its proposed action with the plan or law."

The Council on Environmental Quality (CEQ) regulations at 40 CFR § 1502.16(c) require the Environmental Consequences section of an EIS to disclose "possible conflicts between the proposed action and the objectives of Federal, regional, State, and local (and in the case of a reservation, Indian Tribal) land use plans, policies and controls for the area concerned." This appendix is referenced in Chapters 3 and 4 of this EIS and provides a complete discussion of any inconsistencies with the plans adopted by Washington County or the City of St. George in compliance with the CEQ regulations.

The CEQ has also provided guidance for situations where a proposed action conflicts with local plans, policies, and controls through their publication *Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations* (46 Federal Register 18026 [1981]). Question 23c asks, "What options are available for the decisionmaker when conflicts with such plans or policies are identified?" CEQ's answer states, "After identifying any potential land use conflicts, the decisionmaker must weigh the significance of the conflicts, among all the other environmental and non-environmental factors that must be considered in reaching a rational and balanced decision. Unless precluded by other law from causing or contributing to any inconsistency with the land use plans, policies or controls, the decisionmaker retains the authority to go forward with the proposal, despite the potential conflict…."

On April 3, 2020, the Bureau of Land Management (BLM) sent an email to Washington County with a list of potential inconsistencies between the proposed conservation measures related to the establishment of Zone 6 supported by an amendment to the BLM St. George Field Office Resource Management Plan (RMP) and the land use plans, policies, and controls adopted by Washington County. There were no potential inconsistencies identified for the Northern Corridor right-of-way (ROW) alternatives, Red Cliffs National Conservation Area RMP amendment, or the remaining sections of the Washington County Habitat Conservation Plan (HCP).

On April 7, 2020, the BLM sent an email to the City of St. George with a list of potential inconsistencies between the alternatives for the Northern Corridor ROW and the land use plans, policies, and controls adopted by the City of St. George. There were no potential inconsistencies identified for the Washington County HCP or the St. George Field Office or Red Cliffs National Conservation Area RMP amendments.

Each of the following items lists the potential inconsistencies as described in the documents adopted by Washington County and the City of St. George. Where there is potential for an inconsistency, each item also includes a discussion of the extent to which the BLM could reconcile the proposed action with the applicable State or local plan or law.

H.1 Washington County – Item 1 (Applicable under Environmental Impact Statement Alternatives 2, 3, and 4)

H.1.1 Washington County Resource Management Plan: Land – Land Use 1.a.iv

"Washington County has a no-net-gain policy for federally managed public lands. Land swaps and conservation should not result in an increase in federally managed acres within the county unless the County Commission makes a specific exception that is in the best interest of the County."

Washington County prepared an Amended HCP to support its application for renewal of the 1996 Incidental Take Permit for Mojave desert tortoise. The HCP's description of the proposed Zone 6 includes the following provision:

"Washington County and the HCP Partners will expand the target acquisition area for the Reserve to include the proposed Reserve Zone 6 boundary. Washington County and the HCP Partners intend and agree to prioritize opportunities for the SITLA-owned lands to be acquired by Washington County or other conservation entities to support the recovery of the MDT. Washington County and the HCP Partners anticipate that the acquisition of SITLA-owned lands within Reserve Zone 6 will use the same mechanisms and be subject to the same provisions as described in Chapter 6.3.1.2."

HCP Section 6.3.1.2, Reserve Acquisition Strategy, states that "the Reserve boundary defines a target acquisition area for the consolidation of most remaining private and SITLA-owned lands into BLM or UDNR ownership or management." Non-Federal lands account for approximately 20,000 acres within Zones 1 through5 and the proposed Zone 6 and, if acquired by the BLM, would likely lead to a net increase of Federally managed public lands within Washington County.

While this level of net gain of Federally managed public lands may be inconsistent with the Washington County RMP, an exception by the County Commission would officially be documented through the approval of the Amended HCP it has prepared and the Chairperson's signature on the accompanying Implementation Agreement.

H.2 Washington County – Item 2 (Applicable under Environmental Impact Statement Alternatives 2, 3, and 4)

H.2.1 Washington County Resource Management Plan: Land – Livestock Grazing 3.a.ii

"Washington County opposes any loss of AUMs absent scientific proof of resource degradation."

Alternatives for livestock grazing management on BLM-administered lands within Zone 6 range from maintaining all allotments as available for livestock grazing to designating all allotments as unavailable. There is no current "scientific proof of resource degradation" specifically due to livestock grazing within Zone 6. If allotments are made unavailable through the St. George Field Office RMP amendment, it would be inconsistent with the Washington County RMP. However, HCP Section 9.1.1.1, Add Reserve Zone 6, states:

"Washington County and the HCP Partners will coordinate with the holders of active grazing permits applicable to Reserve Zone 6 and negotiate the acquisition of such grazing permits from willing sellers. However, like Reserve land acquisitions, no entity will be required or compelled to sell, donate, transfer, purchase, or receive interest in lands for the purpose of this Amended HCP.

Nor does this establish a timetable for completing grazing permit acquisitions for Reserve Zone 6. Nevertheless, Washington County and the HCP Partners have demonstrated the ability to successfully and expeditiously negotiate such transactions. This conservation action will benefit both MDT and listed plants within Reserve Zone 6. Estimated cost over 25 years = $259,540."

While a reduction in the per animal unit month (AUM) that is not linked to resource degradation may be inconsistent with the Washington County RMP, an exception by the County Commission would officially be documented through the approval of the Amended HCP it has prepared and the Chairperson's signature on the accompanying Implementation Agreement.

H.3 Washington County – Item 3 (Applicable under Environmental Impact Statement Alternatives 2, 3, and 4)

H.3.1 Washington County Resource Management Plan: Land – Livestock Grazing 3.b.iv

"AUMs within the county remain at or above current levels unless a scientific need for reduction is demonstrated to the satisfaction of the county."

See response to Washington County – Item 2.

H.4 Washington County – Item 4 (Applicable under Environmental Impact Statement Alternatives 2, 3, and 4)

H.4.1 Washington County Resource Management Plan: Land – Land Access 4.d.i

"Property necessarily includes access. Livestock trails, historic trails, historic roads, and any other similar access routes should be maintained wherever they don't interfere with private property rights."

Alternatives for the management of BLM-administered Zone 6 include potential closure of some existing routes located on BLM-administered lands. Although specific routes have not been identified, the closures in this area would not likely be the result of interference with private property rights and would not be consistent with the Washington County RMP. However, HCP Section 9.1.1.1, Add Reserve Zone 6, states that "Washington County, BLM, and the other HCP Partners agree to reduce the total mileage of designated recreation access routes within Reserve Zone 6."

While route closures that are not linked to interference with private property rights may be inconsistent with the Washington County RMP, an exception by the County Commission would be officially documented through the approval of the Amended HCP it has prepared and the Chairperson's signature on the accompanying Implementation Agreement.

H.5 Washington County – Item 5 (Applicable under Environmental Impact Statement Alternatives 2, 3, and 4)

H.5.1 Washington County Resource Management Plan: Other Resources – Mining and Minerals 1.b.iii

"Federally managed public lands remain open to mining and mineral claims, including claims for aggregate materials, sand, gravel, picture rock, and similar products except where the county agrees that extraction activities would be inappropriate."

Alternatives for the management of BLM-administered lands within Zone 6 include potential closures to saleable (for example, sand and gravel) and fluid (for example, oil and gas) minerals, as well as recommending the withdrawal from locatable minerals. The management of the Red

Bluff Area of Critical Environmental Concern, covering approximately 67 percent of the subsurface minerals in Zone 6, already includes these closures and a recommended withdrawal. Additional closures on the remaining areas within the BLM-administered portion of Zone 6 would not be consistent with the Washington County RMP.

However, HCP Section 6.1.2, Biological Goals and Objectives, states:

> *"1. To the maximum extent practicable, conserve the Upper Virgin River population of MDT within the Plan Area by*
>
> *d. removing land uses from the Reserve that are not Covered Activities and that impact the MDT, such as land development, grazing, off-road use, mining, and others;"*

Limiting or prohibiting disturbance associated with mining within the proposed Zone 6 would be consistent with management of other portions of the existing Reserve. An exception by the County Commission would officially be documented through the approval of the Amended HCP it has prepared and the Chairperson's signature on the accompanying Implementation Agreement.

H.6 City of St. George – Item 1 (Applicable under Environmental Impact Statement Alternative 6)

H.6.1 St. George General Plan: Section 7.2.1., Downtown Strategies

"8. Re-install on-street parking throughout the downtown—possible in conjunction with a one-way couplet to accommodate traffic capacities."

The conceptual design for the Northern Corridor portion of Alternative 6 would involve the conversion of two downtown streets—St. George Boulevard and 100 South—each to opposing one-way streets. They are projected to be three lanes wide, which may or may not leave enough remaining width in the public ROW to accommodate on-street parking. In addition, the conceptual design of Alternative 6 is intended to promote maximum movement of vehicles through the corridor to address congestion concerns in the larger area, which would be counter to the traffic-calming and business-friendly intent of providing on-street parking. The final design of the one-way couplet, if implemented, would be completely outside the jurisdiction of the Federal agencies, and the City of St. George would resolve any potential inconsistencies as it sees fit. The City of St. George could choose not to implement Alternative 6, in which case the desired outcomes of reducing congestion, increasing capacity, and improving east-west mobility would not be realized.

H.7 City of St. George – Item 2 (Applicable under Environmental Impact Statement Alternative 6)

H.7.1 St. George General Plan: Section 7.2.1., Downtown Strategies

"14. Promote a pedestrian-friendly downtown atmosphere through the use of neck-downs at street corners, sidewalk paving accents, coordinated street furniture (lights, benches, trash bins, etc.), awnings, and street trees or shrubs in or adjacent to sidewalks."

See response to City of St. George – Item 1. The remaining ROW width may not provide enough space for the improvements listed in this item. In addition, creating a pedestrian-friendly atmosphere would depend on the speed limits and design improvements incorporated in the final design. The final design of the one-way couplet, if implemented, would be completely outside the jurisdiction of the Federal agencies, and the City of St. George would resolve any potential inconsistencies as it sees fit.

H.8 City of St. George – Item 3 (Applicable under Environmental Impact Statement Alternative 6)

H.8.1 St. George General Plan: Section 7.2.1., Downtown Strategies

"15. Develop a landscaped median in the core section of St. George Boulevard."

The conversion of St. George Boulevard from its existing two-way configuration to a one-way street would not accommodate medians between the travel lanes. Existing landscape medians would likely be removed as part of the reconstruction. The final design of the one-way couplet, if implemented, would be completely outside the jurisdiction of the Federal agencies, and the City of St. George would resolve any potential inconsistencies as it sees fit.

H.9 References

Council of Environmental Quality (CEQ). 1981. "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations." Memorandum for Federal NEPA Liaisons, Federal, State, and Local Officials and Other Persons Involved In The NEPA Process. *Federal Register.* Vol. 46, No. 18026. (March 1981).

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Appendix I: Air Quality Technical Report

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Northern Corridor

Air Quality Technical Report

Final

October 2020

Prepared for:
U.S. Department of the Interior Bureau of Land Management
Fish & Wildlife Service

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Contents

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Acronyms and Abbreviations

°C	degree(s) Celsius
°F	degree(s) Fahrenheit
$\mu g/m^3$	microgram(s) per cubic meter
BLM	Bureau of Land Management
CAA	Clean Air Act
CAP	criteria air pollutant
CFR	*Code of Federal Regulations*
CH_4	methane
CO	carbon monoxide
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FHWA	Federal Highway Administration
GHG	greenhouse gas
HAP	hazardous air pollutant
I-15	Interstate 15
IPCC	Intergovernmental Panel on Climate Change
MOVES	Motor Vehicle Emissions Simulator
MSAT	Mobile Source Air Toxic
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NCA	National Conservation Area
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NO_2	nitrogen dioxide
O_3	ozone
Pb	lead
PM_{10}	particulate matter, 10 micrometers or less in diameter
$PM_{2.5}$	particulate matter, 2.5 micrometers or less in diameter
ppb	part(s) per billion
ppm	part(s) per million
RCP	Representative Concentration Pathways
ROW	right-of-way
SAFE	Safer Affordable Fuel-Efficient

SIP	State Implementation Plan
SO_2	sulfur dioxide
UDAQ	Utah Division of Air Quality
UDOT	Utah Department of Transportation
VMT	vehicle miles traveled
VOC	volatile organic compound

1. Introduction

Transportation models show the existing transportation network in Washington County does not have enough capacity for the increased demand of a growing population. In response, the Utah Department of Transportation (UDOT) filed a right-of-way (ROW) application for a proposed highway, referred to as the Northern Corridor, on the Bureau of Land Management (BLM)-administered Red Cliffs National Conservation Area (NCA). This action initiated the National Environmental Policy Act (NEPA) process requiring preparation of an Environmental Impact Statement (EIS). This Air Quality Technical Report is being prepared in support of the EIS.

2. Proposed Action and Alternatives – Northern Corridor

If the BLM selects an alternative that would cross BLM-administered public lands, the BLM's action would be to grant a ROW to UDOT for the construction, operation, and maintenance of the Northern Corridor across those lands. The ROW would be subject to BLM terms and conditions.

The three Northern Corridor alternatives within the Red Cliffs NCA (the T-Bone Mesa Alignment, UDOT Application Alignment, and Southern Alignment) vary in location and tie-in locations with Red Hills Parkway, but all share the following common features:

- Up to 500-foot-wide ROW.
- 4-lane highway with two, 12-foot-wide travel lanes in each direction, 8-foot shoulders, and a center median.
- A combination of curb and gutter, drainage swales, and ditches.
- Bicycle and pedestrian trail(s).
- Associated signage.
- A new intersection for connection to Red Hills Parkway, as well as a new intersection at Cottonwood Spring Road (also known as Old Dump Road or Turkey Farm Road).

The Red Hills Parkway Expressway and St. George Boulevard/100 South One-way Couplet alternatives lie predominantly or entirely outside the NCA and propose improvements to existing roadway infrastructure rather than a new highway within the NCA.

Under the No Action Alternative, the BLM would deny UDOT's application for a ROW across the Red Cliffs NCA for the Northern Corridor. The alternative reflects all the roadway and transit improvements from the applicable local, regional, and statewide transportation plans that would be completed by 2050, absent the Northern Corridor.

The alternatives are shown on Figure 1.

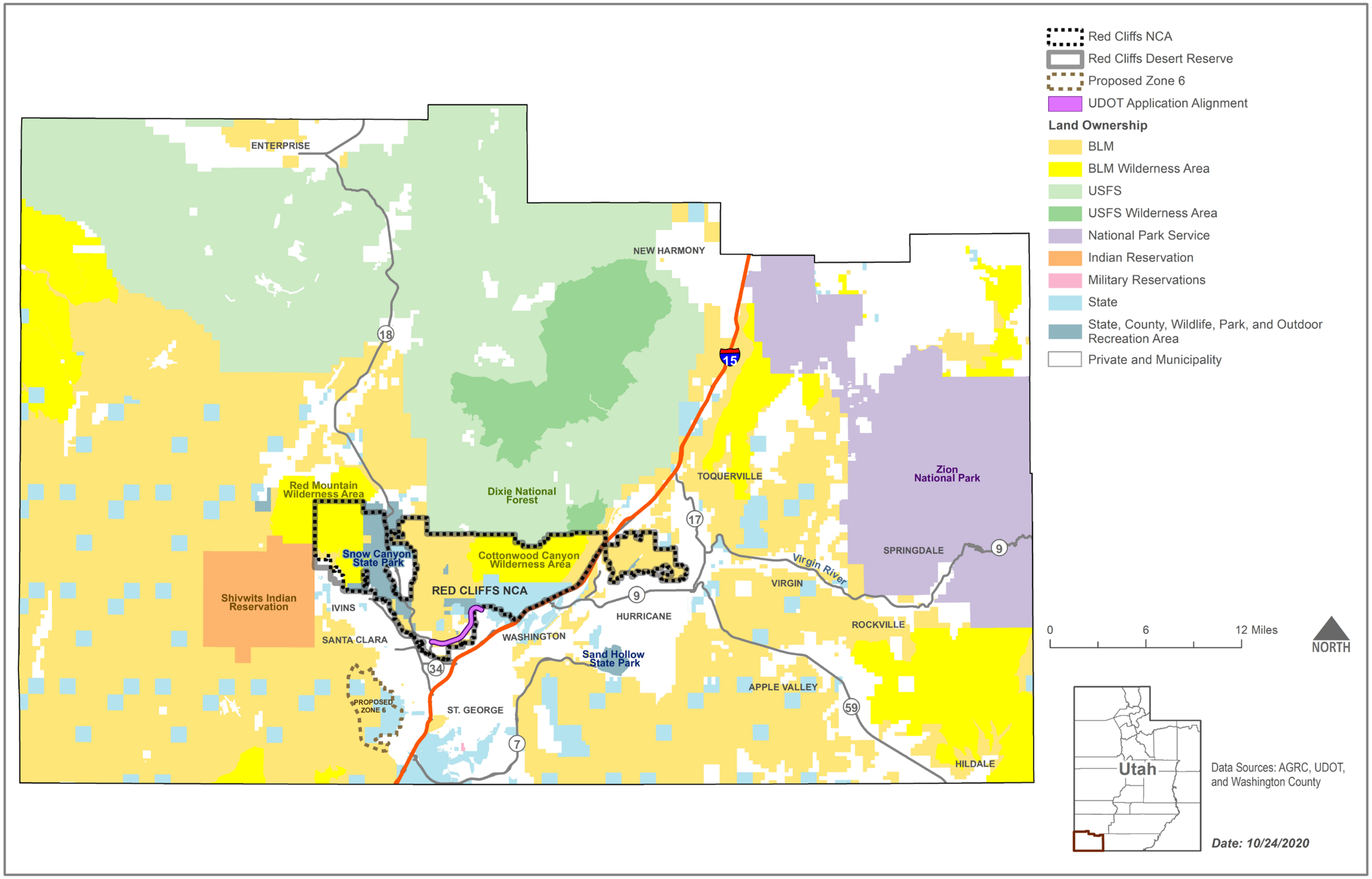

Figure 1. Proposed Northern Corridor Alternatives

3. Regulatory Setting

Federally funded transportation projects must meet the requirements of the 1970 Federal Clean Air Act (CAA) (42 United States Code Section 7401), which governs air quality in the United States. The U.S. Environmental Protection Agency (EPA) is responsible for enforcing the CAA. The EPA has established nationwide air quality standards to protect public health and welfare with an adequate margin of safety. These Federal standards, known as the National Ambient Air Quality Standards (NAAQS), are required under the 1977 CAA and subsequent amendments (Table 1).

3.1 Ambient Air Quality Standards

Table 1. NAAQS Standards for Criteria Air Pollutants

Pollutant	Primary or Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)	Primary	8 hours	9 ppm	Not to be exceeded more than once per year
Carbon Monoxide (CO)	Primary	1 hour	35 ppm	Not to be exceeded more than once per year
Lead (Pb)	Primary and Secondary	Rolling 3-month average	0.15 μg/m^3 [a]	Not to be exceeded
Nitrogen Dioxide (NO_2)	Primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, average over 3 years
Nitrogen Dioxide (NO_2)	Primary and Secondary	Annual	53 ppb [b]	Annual mean
Ozone	Primary and Secondary	8 hours	0.070 ppm [c]	Annual fourth-highest maximum 8-hour concentration, averaged over 3 years
$PM_{2.5}$	Primary	Annual	12.0 μg/m^3	Annual mean, averaged over 3 years
$PM_{2.5}$	Secondary	Annual	15.0 μg/m^3	Annual mean, averaged over 3 years
$PM_{2.5}$	Primary and Secondary	24 hours	35 μg/m^3	98th percentile, averaged over 3 years
PM_{10}	Primary and Secondary	24 hours	150 μg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)	Primary	1 hour	75 ppb [d]	99th percentile of 1-hour daily maximum concentrations, average over 3 years
Sulfur Dioxide (SO_2)	Secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

Source: EPA 2019a

[a] In areas designated non-attainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 μg/m^3 as a calendar quarter average) also remain in effect.

[b] The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

[c] Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards also remain in effect in some areas. Revocation of the previous (2008) O_3 standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

[d] The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) also will remain in effect in certain areas, as follows: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards and (2) any area for which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated non-attainment under the previous SO_2 standards or is not meeting the requirements of a State Implementation Plan (SIP) call under the previous SO_2 standards (40 Code of Federal Regulations [CFR] part 50.4). A SIP call is an EPA action requiring a state to resubmit all or part of its SIP to demonstrate attainment of the required NAAQS.

Notes:

$\mu g/m^3$ = microgram(s) per cubic meter
ppb = part(s) per billion
ppm = part(s) per million

Under the CAA, NAAQS have been established for six criteria air pollutants (CAPs): carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter (10 micrometers or less in diameter [PM_{10}] and 2.5 micrometers or less in diameter [$PM_{2.5}$]), ozone (O_3), and sulfur dioxide (SO_2). The NAAQS represent safe levels of each pollutant to avoid specific adverse effects to human health and the environment.

The Utah Division of Air Quality (UDAQ) is responsible for ensuring the air in Utah meets health and visibility standards established under the Federal CAA. These standards are known as the NAAQS and have been adopted by the State of Utah. The UDAQ also endorses rules pertaining to air quality standards, develops plans to meet the Federal standards when necessary, issues preconstruction and operating permits to stationary sources, and ensures compliance with State and Federal air quality rules. In addition, UDAQ collects air quality data through monitoring stations.

3.2 Attainment Status

The Federal CAA requires EPA to classify areas in the country as attainment or non-attainment with respect to each criteria pollutant, depending on whether the areas meet the applicable NAAQS. If the air quality in a geographic region meets or measures less than the standards, it is called an attainment area; areas that do not meet or exceed the standards are called non-attainment areas. Once a non-attainment area meets the standards and additional re-designation requirements in the CAA (Section 107(d)(3)(E)), EPA will designate the area as a "maintenance area."

The study area is located within the City of St. George in Washington County, Utah. Washington County is designated as an attainment or unclassifiable area for all criteria pollutants. Figure 2 shows the project area in relation to the State attainment and non-attainment areas.

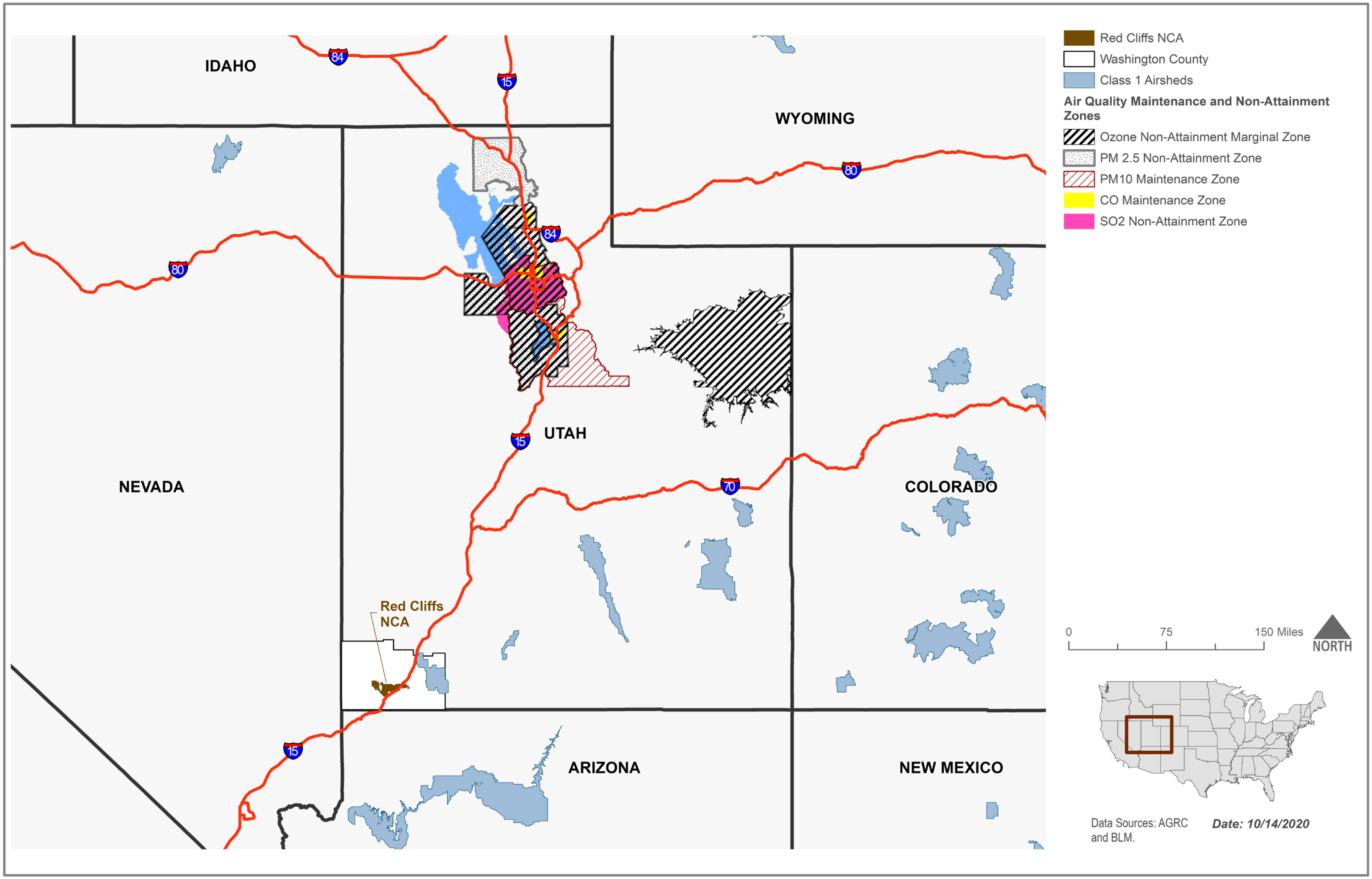

Figure 2. Air Quality Attainment Areas and Class I Airsheds

3.3 Transportation Conformity

Transportation conformity applies to transportation projects that receive federal funding or require Federal Highway Administration (FHWA) or Federal Transit Administration approval. Conformity requirements apply only in non-attainment and maintenance areas for the NAAQS and only for the specific NAAQS that are or were violated. Conformity requirements do not apply in unclassifiable/attainment areas for NAAQS.

Transportation conformity takes place on two levels: the regional—or planning and programming—level and the project level. A transportation project must conform at both levels to be approved. Regional conformity is demonstrated when a project is included in a financially constrained conforming Transportation Improvement Program and Long-Range Transportation Plan. At the project level, a project must not cause a new local violation of the NAAQS or exacerbate an existing violation of the Federal standards for CO, PM_{10}, and $PM_{2.5}$.

Because UDOT's proposed action will not be receiving funding assistance through the Federal-aid Highway Program and it does not require FHWA approval, the project is not subject to the transportation conformity regulations, and regional and project level hot spot analyses are not required. However, if the proposed project receives federal funds or requires federal approval in the future, transportation conformity would apply.

3.4 Mobile Source Air Toxics

Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments of 1990, whereby Congress mandated that the EPA regulate 188 air toxics, also known as hazardous air pollutants (HAPs). The EPA assessed this expansive list in its rule on the Control of HAPs from Mobile Sources (*Federal Register, Vol. 72, No.* 37, page 8430, February 26, 2007) and identified a group of 93 compounds emitted from mobile sources that are part of EPA's Integrated Risk Information System (2019d). In addition, EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and non-cancer hazard contributors from the 2011 National Air Toxics Assessment. These are 1,3-butadiene,acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. While the FHWA considers these the priority mobile source air toxics (MSAT), the list is subject to change and may be adjusted in consideration of future EPA rules.

3.5 Climate Change and Greenhouse Gases

Human activity is changing the earth's climate by causing the buildup of heat-trapping greenhouse gas (GHG) emissions through the burning of fossil fuels and other human activities. Carbon dioxide (CO_2) from transportation sources is the largest component of human-produced emissions in the United States; other prominent emissions include methane (CH_4), nitrous oxide (N_2O), and hydrofluorocarbons (EPA 2019c). These emissions are different from CAPs because their effects in the atmosphere are global rather than local, and also because they remain in the atmosphere for decades to centuries, depending on the substance.

Climate change affects human health and natural ecosystems. Observed changes include, but are not limited to, an increase in sea level, high temperatures, melting of glaciers, stronger storms and hurricanes, wildfires, and shifting of habitats. Scientists have warned that significant and potentially dangerous shifts in climate and weather are possible without substantial reductions in GHG emissions. They commonly have cited 2 degrees Celsius (°C) (1°C beyond warming that has already occurred) as the total amount of warming the earth can tolerate without serious and potentially irreversible climate effects (Intergovernmental Panel on Climate Change [IPCC] 2014).

3.6 Air Quality Regulations for Construction Emissions

Construction activities have the potential to generate fugitive dust emissions, which are subject to the following codes:

- St. George City Code, Title 4: Health and Safety, Chapter 9: Air Quality Regulations.
- Utah Administrative Code R307-205, Emissions Standards: Fugitive Emissions and Fugitive Dust.

Per St. George City Code, preparation of a dust control plan would be required to specify best practical methods that would be used to control the generation of fugitive dust. In addition, a dust control permit would be required.

4. Methodology

4.1 Mobile Source Air Toxics

The FHWA *Updated Interim Guidance on Mobile Source Air Toxics Analysis in NEPA Documents* (FHWA 2016) was used to assess potential emissions from MSATs. FHWA has developed a tiered approach for analyzing MSATs in NEPA documents. Depending on the specific project circumstances, FHWA has identified three levels of analysis:

1) *No analysis for projects with the potential for meaningful MSAT effects.*

   Projects of this level are those qualifying as a categorical exclusion under 23 CFR part 777.117 (c), or exempt under the CAA conformity rule under 40 CFR part 93.126, or with no meaningful impact on traffic volumes or vehicle mix.

2) *Qualitative analysis for projects with low potential MSAT effects.*

   Projects at this level include those that serve to improve operations of highway, transit, or freight without adding substantial new capacity or without creating a facility that is likely to meaningfully increase emissions.

3) *Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects.*

   Projects at this level are those with the potential for meaningful differences among project alternatives. To fall under this category, the project must create or significantly alter a major intermodal freight facility that has the potential to concentrate high levels of diesel PM in a single location or create new or add significant capacity to urban highways such as interstates, urban arterials, or urban collector-distributor routes with traffic volumes where the annual average daily traffic is projected to be in the range of 140,000 to 150,000 or greater, by design year.

Table 2 shows that future year traffic for each of the roadway segments under all alternatives is anticipated to be lower than this threshold. Therefore, a level II qualitative analysis for projects with low potential for MSAT effects was conducted.

Table 2. Annual Average Daily Traffic

Roadway	Segment	2017 Existing	No Action	T-Bone Mesa Alignment	UDOT Application Alignment	Southern Alignment	Red Hills Parkway Expressway	St. George Boulevard/ 100 South One-way Couplet
Bluff Street	Snow Canyon to Sunset	15,000	31,000	33,000	32,000	31,000	32,000	33,000
Bluff Street	Sunset to St. George	41,000	65,000	61,000	61,000	63,000	55,000	62,000
St. George Boulevard	Bluff to Main	19,000	26,000	23,000	23,000	25,000	19,000	16,000
St. George Boulevard	Main to 1000 East	31,000	36,000	34,000	34,000	36,000	32,000	26,000
St. George Boulevard	1000 East to I-15 ramps	44,000	55,000	50,000	52,000	55,000	47,000	47,000
Red Hills Parkway	Bluff to Skyline	12,000	31,000	39,000	38,000	32,000	47,000	32,000
Red Hills Parkway	Skyline to 1000 East	20,000	38,000	28,000	23,000	36,000	54,000	38,000
Red Hills Parkway	1000 East to I-15 crossing	12,000	20,000	18,000	22,000	20,000	24,000	23,000
100 South	Bluff to Main	9,000	12,000	12,000	13,000	12,000	11,000	17,000
100 South	Main to 1000 East	16,000	24,000	22,000	23,000	24,000	20,000	29,000
100 South	1000 East to River	16,000	34,000	32,000	33,000	34,000	31,000	27,000

Source: Horrocks Engineers, 2020

Note: I-15 = Interstate 15

In April 2020, the National Highway Traffic Safety Administration (NHTSA) and EPA, on behalf of the Department of Transportation, issued a final Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021 – 2026 Passenger Cars and Light Trucks. This final rule amends and establishes carbon dioxide and fuel economy standards and is effective on June 29, 2020. Motor Vehicle Emissions Simulator (MOVES) modeling conducted for the MSAT analysis as documented in the FHWA 2016 guidance has not been revised with these updated fuel economy standards. Therefore, the qualitative analysis addresses how this rule may affect MSATs.

4.2 Climate Change and Greenhouse Gases

The Council on Environmental Quality has published draft guidance (Council on Environmental Quality 2019) on how GHG emissions should be addressed in NEPA analyses and documents. If finalized, this guidance would replace the final guidance issued on August 1, 2016, which was withdrawn effective April 5, 2017, per Executive Order 13783 of March 28, 2017. The proposed project is located in an attainment area where the air quality is generally good. Therefore, consistent with the methods for other pollutants, a qualitative discussion of GHGs was conducted.

4.3 Construction

The proposed project is located in an attainment or unclassifiable area. Construction activities would be temporary, and emissions generated during construction would not affect the long-term attainment. Therefore, a qualitative discussion of temporary construction emissions will be conducted.

5. Affected Environment

5.1 Climate

The proposed project, at an elevation of approximately 3,300 feet above sea level, is located within portions of Washington County in the southwestern corner of the State of Utah. According to the Western Regional Climate Center, the St. George Station is the closest weather data station to the proposed project, located in the Dixie climate division of Utah. Data were measured at this station from 1893 to 2016. The average minimum temperature during the winter months is approximately 30 degrees Fahrenheit (°F), while the average maximum temperature during the summer months is approximately 90°F. Annual average snowfall is approximately 3 inches and occurs mostly within the month of January. Annual average precipitation is approximately 8 inches and occurs mostly within the month of January. Prevailing wind directions are primarily from a west or east-northeast direction (BLM 2018).

5.2 Existing Air Quality

The UDAQ operates a network of monitoring stations within the State of Utah and is responsible for reporting results to the EPA. Monitoring data were downloaded from the EPA Interactive Map of Air Quality Monitors. Table 3 summarizes the maximum concentrations of CAPs at nearby monitoring stations and displays the NAAQS for comparison. None of the monitored pollutants have violated the NAAQS for at least the past 5 years. Figure 3 shows the location of the monitoring station.

Table 3. Maximum Pollutant Concentrations at Nearby Monitoring Stations

Pollutant	Monitoring Stations	Averaging Time	NAAQS	2015	2016	2017	2018	2019
Nitrogen Dioxide (ppb)	Hurricane – 147 North 870 West	1-hour (98th percentile)	100	14	32	26	27	24
Ozone (ppm)	Hurricane – 147 North 870 West	8-hour (4th max)	0.070	0.069	0.062	0.067	0.069	0.064
Particulate Matter less than 2.5 microns (μg/m^3)	Hurricane – 147 North 870 West	24-hour (98th percentile)	35	15	8.4	13.5	17.9	8.8

Source: EPA 2019b

The EPA calculates daily air quality index based on local air monitoring data. Within the St. George area pollutants of most concern are NO_2, ozone, and $PM_{2.5}$. According to the BLM Air Monitoring Report (BLM 2018), the air quality index within Washington County is good approximately 76 percent of the days and moderate 24 percent of the days based on 2015 to 2017 monitoring data. During this time, Washington County has not had an air quality index category of unhealthy.

5.3 Class I and II Areas

Under the prevention of significant deterioration provisions of the CAA, land classifications have been established for areas with air quality better than the NAAQS (attainment areas). The CAA gives protection to national parks and national wilderness areas, known as Class I areas. All other areas are designated as Class II areas unless designated as non-attainment areas. Class II areas allow for a moderate amount of air quality deterioration.

According to the National Park Service, Zion National Park is designated as a Class I area and is within Washington County approximately 20 miles east from the proposed project (Figure 3). The highest elevation at Zion National Park is approximately 7,000 feet, significantly higher compared to an approximate elevation of 3,300 feet for the proposed highway alternatives. All other areas of Washington County are designated as Class II areas because the county is in attainment for all NAAQS.

Per 40 CFR part 52.21, prevention of significant deterioration of air quality, construction of the proposed project would not be considered a major stationary source that would result in significant emission increases. Therefore, a qualitative discussion was conducted.

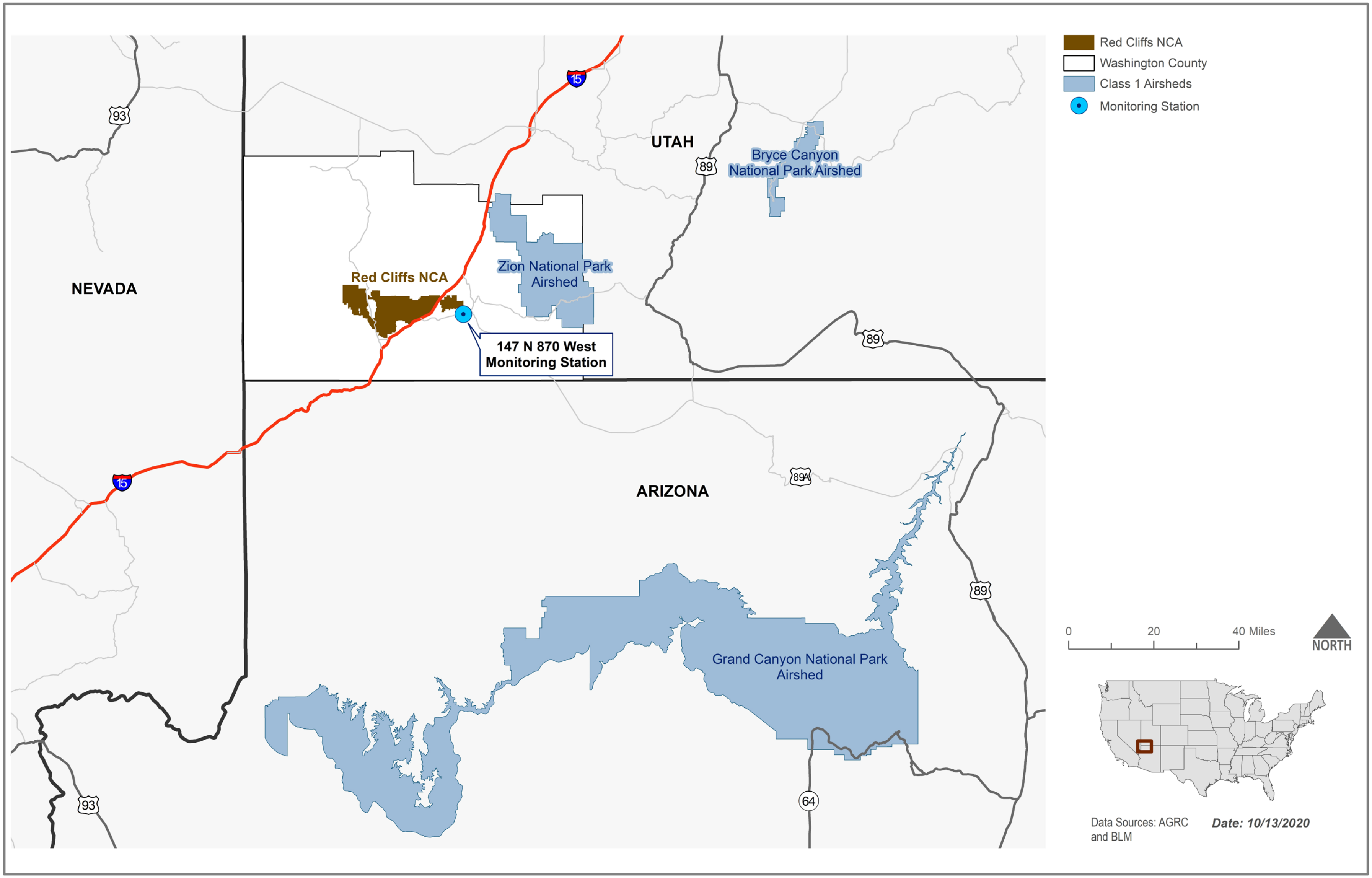

Figure 3. Air Quality Monitoring Station within Washington County

5.4 Air Quality Emissions Data

According to the UDAQ 2018 Annual Report, the 2014 triennial inventory is the most recent statewide inventory available. The 2017 triennial data will be used in the 2019 annual report once reviewed and approved. Figure 4 summarizes the triennial emissions by source category and shows the largest sources of CAPs in Utah are on-road mobile sources for CO, point sources for nitrogen oxides (NO_x) and SO_x, area sources[1] for PM_{10} and $PM_{2.5}$, and biogenic sources[2] for volatile organic compounds (VOCs). Compared to the 2011 statewide inventory, on-road emissions have decreased as a result of newer vehicle fleets statewide as well as EPA's Tier 2 emissions standards for newer vehicles.

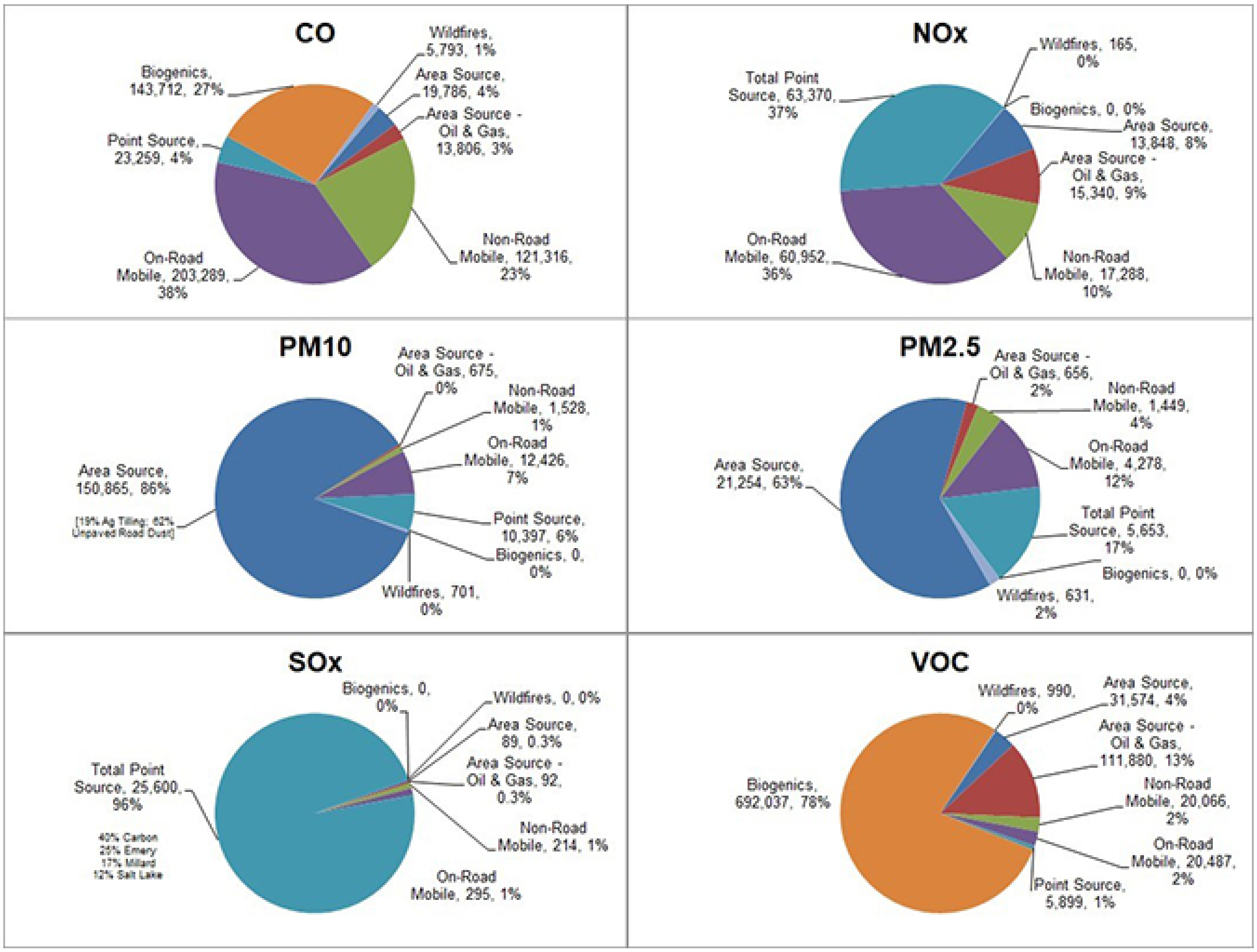

Figure 4. 2014 Triennial Emissions Inventory by Source Category – Statewide, Annual (Tons/Year)

Source: UDAQ 2018

Table 4 summarizes the CAP emissions for the St. George area and shows the largest sources of CAPs in the area are on-road mobile sources for CO, NO_x, and SO_x, area sources for PM_{10} and $PM_{2.5}$, and biogenic sources for VOCs.

[1] **Area sources** are sources of pollution that emit less than 10 tons annually of a single hazardous air pollutant or less than 25 tons annually of a combination of hazardous air pollutants from a specific area.

[2] Examples of **biogenic sources** include animal management operations and oak and pine tree forests.

Table 4. 2014 CAP Emissions in tons per year by Source for the St. George Field Office in Washington County

Source	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_x	VOCs
Area	330.11	146.45	3,910.88	527.27	1.52	287.47
Area (Oil and Gas)	0.00	0.00	0.00	0.00	0.00	0.00
Non-Road Mobile	1,537.14	147.51	22.21	20.95	1.23	477.56
On-Road Mobile	2,650.00	880.60	209.69	70.92	3.53	270.00
Point	17.67	2.99	7.72	3.73	0.34	3.48
Biogenics	1,679.96	0.00	0.00	0.00	0.00	11,416.92
Wildfires	0.00	0.00	0.00	0.00	0.00	0.00
County Total	**6,214.88**	**1,177.55**	**4,150.50**	**622.87**	**6.62**	**12,455.43**

Source: BLM 2018

Construction activities can generate temporary PM emissions within the project area as a result of earth-moving and use of heavy equipment, and land clearing, ground excavation, cut-and-fill operations, and the roadway construction. Fugitive dust is typically generated directly from construction sites, unpaved roads, wildfires, wood burning, gravel pits, and agricultural activities. Secondary particulates usually form in the atmosphere as a result of complex reactions of chemicals such as SO_2, VOCs, and NO_x from power plants, industries, and automobiles. Area sources of PM_{10} and $PM_{2.5}$ account for approximately 31 percent and 4 percent, respectively, of emissions within Washington County. The majority of the $PM_{2.5}$ emissions within the county are from secondary particulates, while PM_{10} emissions are generally caused by fugitive dust.

5.5 Mobile Source Air Toxics

The EPA has developed the MOVES model and it is periodically updated to ensure it provides accurate emission estimates. MOVES2014 incorporates the latest Federal emissions standard rules at the time of its release, including Tier 3 emissions and fuel standards starting in 2017 (79 *Federal Register* 60344), heavy-duty greenhouse gas regulations that phase in during model years 2014 to 2018 (79 *Federal Register* 60344), and the second phase of light duty greenhouse gas regulations that phase in during model years 2017 to2025 (79 *Federal Register* 60344). Since the release of MOVES2014, EPA has released MOVES2014a, which incorporates inputs of local vehicle miles traveled (VMT), minor updates to the default fuel tables, and corrects an error in MOVES2014 brake wear emissions. Since the release of MOVES2014a, the SAFE rule was issued and will be effective June 26, 2020. The MOVES model has not been updated with the new fuel economy and carbon dioxide standards. However, the projections summarized below should not substantially change since these standards would only change for CO_2 emissions and not overall air pollution. All vehicles built under the new SAFE rule will comply with the EPA's pollution rules, and because new vehicles are subject to stricter anti-pollution rules, air pollution is expected to be reduced as older vehicles that emit more harmful pollution will be retired and replaced by newer, cleaner vehicles (NHTSA 2020).

Using EPA's MOVES2014a model, as shown on Figure 5, FHWA estimates that even if VMT increases by 45 percent from 2010 to 2050 as forecasted, a combined reduction of 91 percent in the total annual emissions for the priority MSAT is projected for the same time period (FHWA 2016).

Diesel PM is the dominant component of MSAT emissions, making up 50 to 70 percent of all priority MSAT pollutants by mass, depending on calendar year.

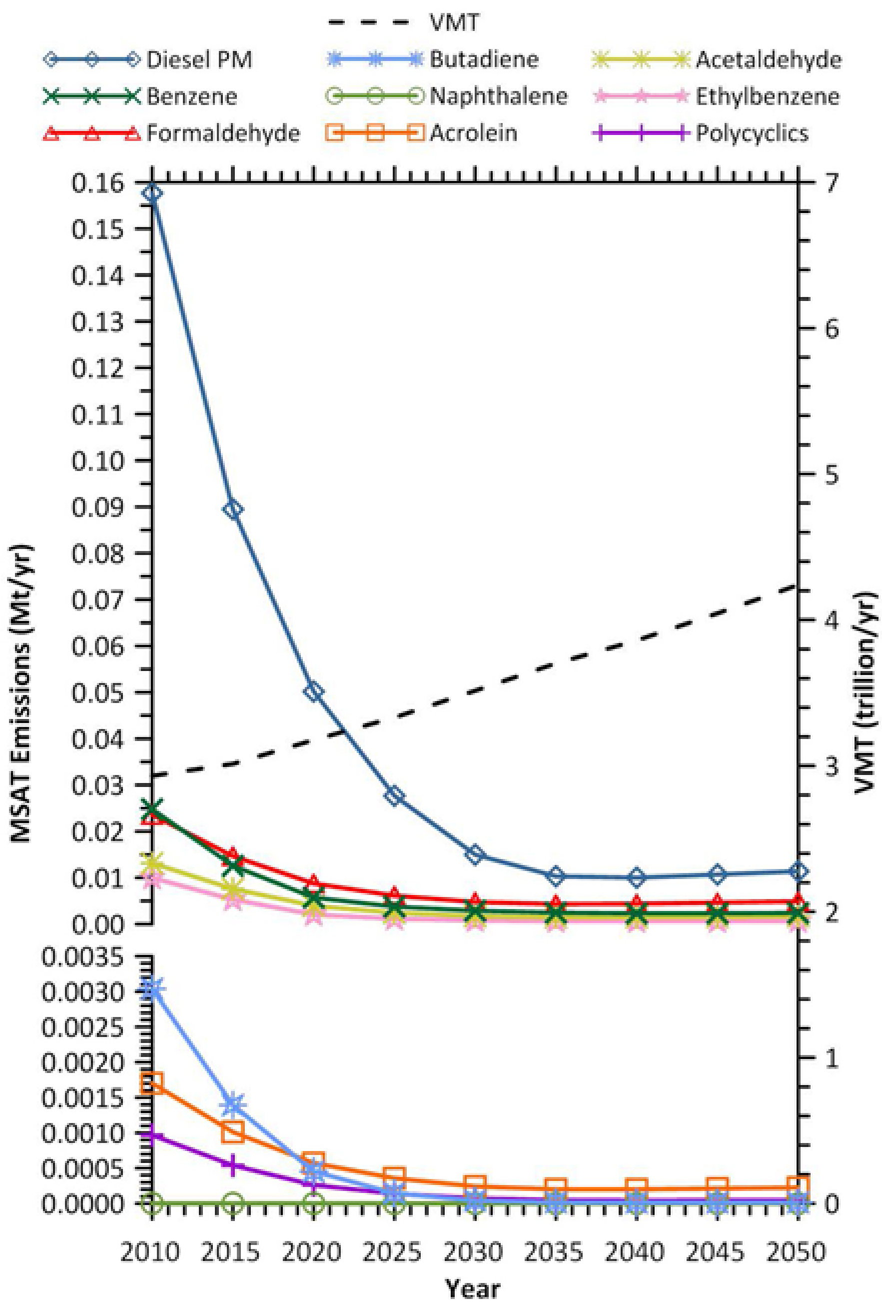

Figure 5. FHWA Projected National MSAT Emission Trends 2010–2050 for Vehicles Operating on Roadways Using EPA's MOVES2014a Model

Source: FHWA 2016

Note: Trends for specific locations may be different, depending on locally derived information representing VMT, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.

5.6 Incomplete or Unavailable Information for Project-Specific MSAT Health Impact Analysis

In FHWA's view, information is incomplete or unavailable to credibly predict the project-specific health impacts as a result of changes in MSAT emissions associated with a proposed set of highway alternatives. The outcome of such an assessment, adverse or not, would be influenced more by the uncertainty introduced into the process through assumption and speculation rather than any genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a proposed action.

The EPA is responsible for protecting the public health and welfare from any known or anticipated effect of an air pollutant. It is the lead authority for administering the CAA and its amendments and has specific statutory obligations with respect to HAPs and MSAT. The EPA is in the continual process of assessing human health effects, exposures, and risks posed by air pollutants.

The methodologies for forecasting health impacts include emissions modeling, dispersion modeling, exposure modeling, and then final determination of health impacts—each step in the process building on the model predictions obtained in the previous step. All are encumbered by technical shortcomings or uncertain science that prevents a more complete differentiation of the MSAT health impacts among a set of project alternatives.

There are considerable uncertainties associated with the existing estimates of toxicity of the various MSAT because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population. This is a concern expressed by the Health Effects Institute, an organization that is also active in the research and analyses of the human health effects of MSAT (FHWA 2016). As a result, there is no national consensus on air dose-response values assumed to protect the public health and welfare for MSAT compounds, and in particular, for diesel PM. The EPA states that with respect to diesel engine exhaust, "[t]he absence of adequate data to develop a sufficiently confident dose-response relationship from the epidemiologic studies has prevented the estimation of inhalation carcinogenic risk (EPA 2019d)."

Because of the limitations in the methodologies for forecasting health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with predicting the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, accident rates, and fatalities, plus improved access for emergency response, which are better suited for quantitative analysis.

5.7 Climate Change and Greenhouse Gases

GHG emissions have accumulated rapidly as the world has industrialized, with concentrations of atmospheric CO_2 increasing from roughly 300 ppm in 1900 to more than 400 ppm today. During this timeframe, global average temperatures have increased by roughly 1.5°F (1°C), and the most rapid increases have occurred during the past 50 years. Scientists have warned that significant and potentially dangerous shifts in climate and weather are possible without substantial reductions in GHG emissions. They commonly have cited 2°C (1°C beyond warming that has already occurred) as the total amount of warming the earth can tolerate without serious and potentially irreversible climate effects. For warming to be below 2°C limited to this level, atmospheric concentrations of CO_2 would need to stabilize at a maximum of 450 ppm, requiring annual global emissions to be reduced 40 to 70 percent below 2010 levels by 2050 (IPCC 2014). To build upon its Fifth Assessment Report, the IPCC prepared a special report to assess the impacts of 1.5°C global warming above pre-industrial levels (that is, from 1850 to 1900). Emissions would need to decline by about 45 percent from 2010 levels by 2030 reaching net zero around 2050. Human-induced warming reached approximately 1°C above pre-industrial levels in 2017, increasing at 0.2°C per decade.

According to the EPA Inventory of U.S. GHG Emissions and Sinks 1990–2017 (EPA 2019c), total emissions of GHGs have increased approximately 1.3 percent from 1990 to 2017. However, from 2016 to 2017, GHG emissions decreased approximately 0.5 percent. The decline in emissions was as a result of the transition of coal to natural gas, other non-fossil fuel energy sources, and other factors. Table 5 summarizes recent trends in U.S. GHG emissions.

Table 5. Recent Trends in U.S. Greenhouse Gas Emissions in million metric tons of CO_2

Gas/Source	1990	2005	2013	2014	2015	2016	2017
CO_2	5121.2	6130.6	5522.9	5572.1	5423.0	5306.7	5270.7
Fossil Fuel Combustion	4738.8	5744.8	5157.4	5199.3	5047.1	4961.9	4912.0
Transportation	1469.1	1857.0	1682.7	1721.6	1734.0	1779.0	1800.6
Electric Power Sector	1820.0	2400.0	2038.3	2037.1	1900.6	1808.9	1732.0
Industrial	857.4	853.4	840.0	819.6	807.9	807.6	810.7
Residential	338.2	357.9	329.3	346.8	317.8	292.9	294.5
Commercial	226.5	226.8	224.6	232.9	245.5	232.1	232.9
U.S. Territories	27.6	49.7	42.5	41.4	41.4	41.4	41.4
Other	382.4	385.8	365.5	372.8	375.9	344.8	358.7

Source: EPA 2019c

According to Utah's Public Health Data Resource, Public Health Indicator Based Information System, GHG emissions within Utah have ranged from 35.5 million metric tons of CO_2 in 1980 to 58.5 million metric tons of CO_2 in 2017, with a peak of 70 million metric tons of CO_2 in 2007 (Figure 6). GHG emissions from transportation sources account for approximately 25 to 30 percent of overall GHG emissions in the state (Table 6). Peak increases during 2007 and 2008 were a result of warm temperatures in the Arctic in 2007 and increased precipitation in the tropics during 2007 and 2008.

According to the National Oceanic and Atmospheric Administration (NOAA) Annual Greenhouse Gas Index, there has been a 43 percent increase to climate forcing (also called radiative forcing) since 1990 because of increasing atmospheric concentrations of GHGs. The CO_2 increase is accelerating; while it averaged about 1.6 ppm per year in the 1980s and 1.5 ppm per year in the 1990s, the growth rate increased to 2.3 ppm per year during the last decade (2009 to 2018) (NOAA 2020).

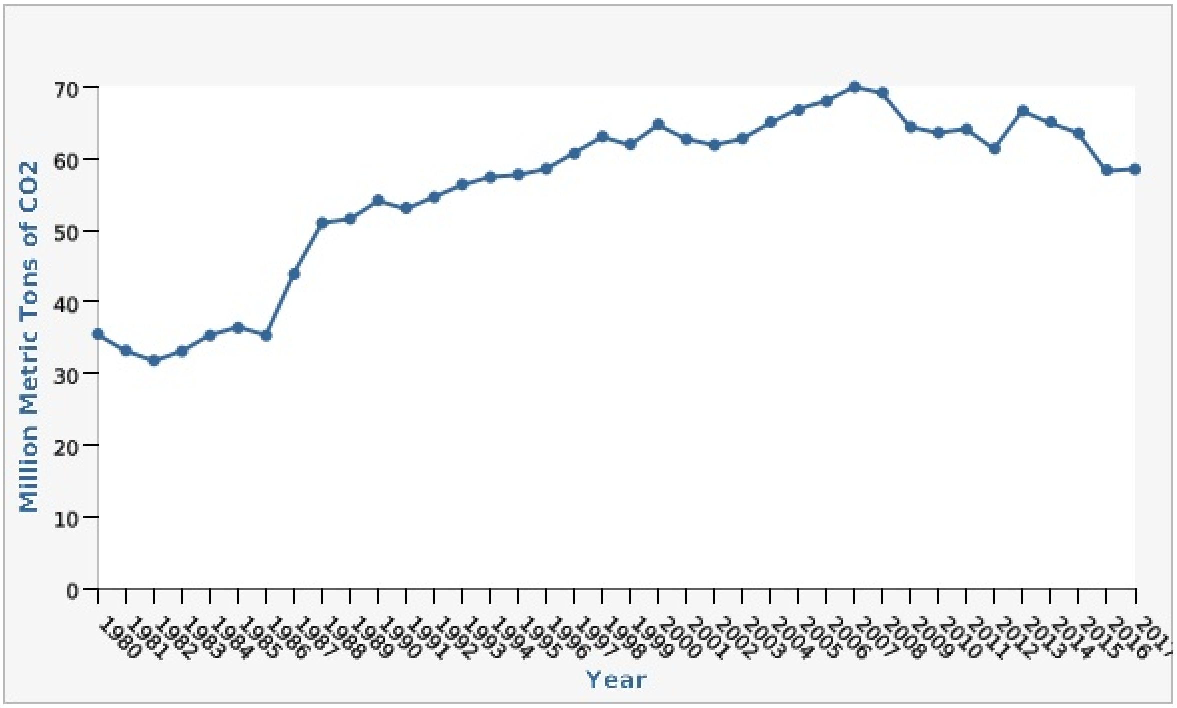

Figure 6. Overall GHG Emission Trends in Utah

Source: IBIS 2020

Table 6. GHG Emissions in Utah in million metric tons of CO_2

Year	Utah Total GHG Emissions	GHG Emissions from Transportation Sources
1980	35.5	9.0
2007	70	18.2
2016	58.5	17.7

Source: IBIS 2020

6. Environmental Consequences

6.1 Class I Area

Mobile sources are a contributor to the visibility impairment within Class I areas. Analysis and modeling have been conducted for the Utah SIP to determine the potential impact of the regional haze program on visibility. According to the Utah SIP for Regional Haze, NO_x and VOC emissions from mobile sources decreased by approximately 55 percent from 2003 to 2018. Federal programs (such as low sulfur diesel, vehicle emission standards, and similar) have helped to reduce mobile source emissions, which benefits Class I areas. Emissions from the action alternatives are not likely to significantly affect these inventories because Zion National Park is located approximately 20 miles away and sits at a much higher elevation compared to the proposed Northern Corridor.

The St. George Municipal Airport weather station has been collecting meteorological data since 1980 (MRCC 2020). Figure 7 shows the wind patterns in the region observed over the past year as a wind rose. Each petal of the wind rose represents a direction the wind is blowing from, with the colors of each petal corresponding to a wind speed. The winds generally blow from the west/southwest and east/southeast, depending on the season, with an annual average windspeed of 6.9 meters per second, or 15 miles per hour. Depending on the season, the prevailing wind direction would be toward Zion National Park. However, any generated local air emissions from the proposed action alternatives are not anticipated to affect the air quality within Zion National Park. These air emissions are anticipated to dissipate over several land uses and be indistinguishable from emissions from other regional sources before reaching the park, located approximately 20 miles away. In addition, the topography between the proposed action alternatives and the park generally increases toward the east. There is a high ridge surrounding the western side of the park that would block some of the local air emissions or increase travel distance.

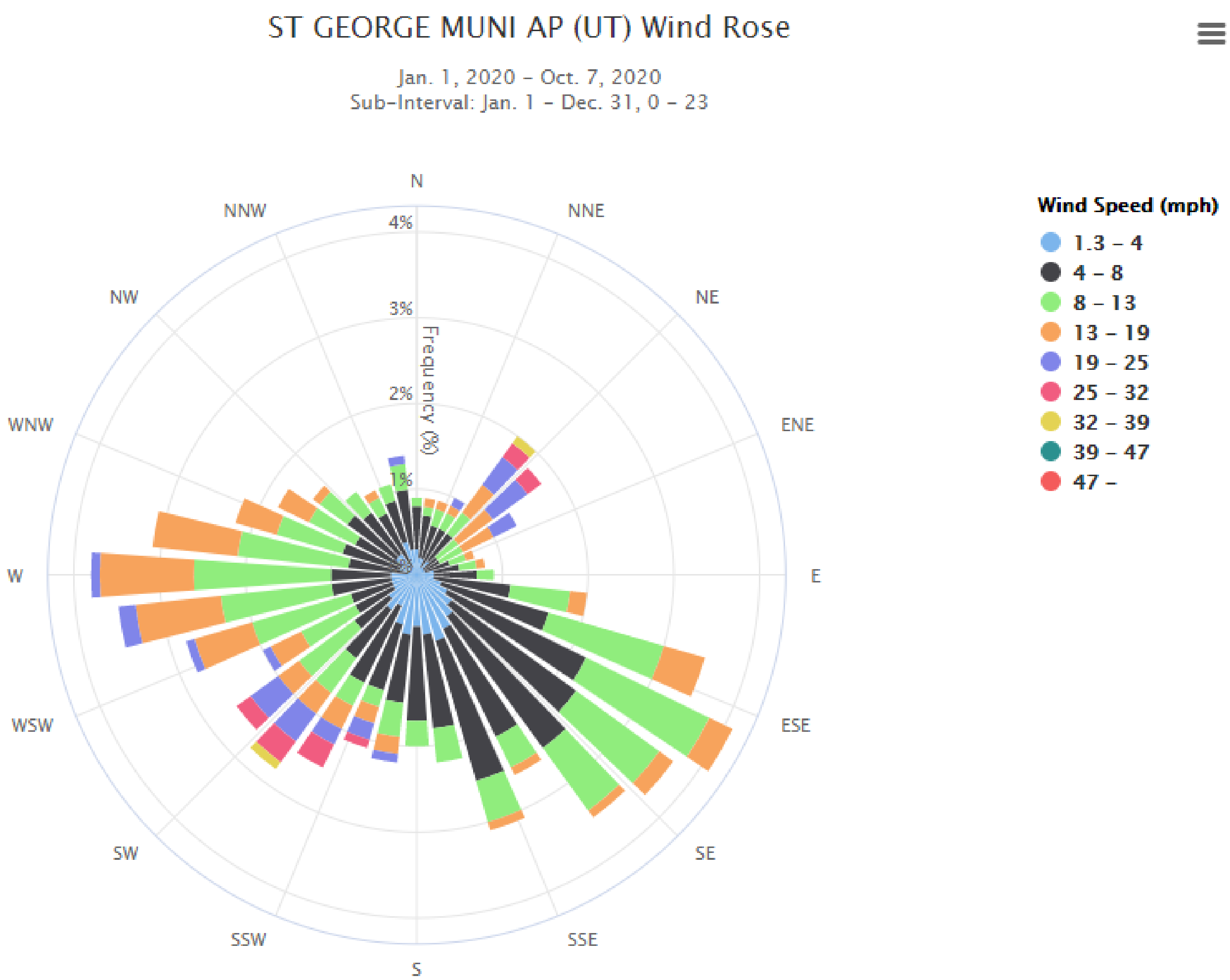

Figure 7. St. George Municipal Airport Utah Wind Rose

Source: MRCC 2020

6.2 Air Quality Emissions

Traffic volumes are anticipated to increase as population increases, resulting in increased air emissions. As shown in the Traffic Analysis Memorandum (Appendix L), the T-Bone Mesa Alignment, UDOT Application Alignment, Red Hills Parkway Expressway, and St. George Boulevard/100 South One-way Couplet alternatives would operate at Level of Service D or better conditions by 2050 for most intersections studied. However, the intersections of Sunset Boulevard/Bluff Street and Green Spring/Telegraph Street would continue to operate at Level of Service D, E, or worse conditions by 2050 under all alternatives. In addition, the intersections of St. George Boulevard/Bluff Street and Red Hills Parkway/1000 East would operate at Level of Service F conditions under the Southern Alignment. As a result, air quality would continue to worsen at these intersections. Although air quality emissions may degrade at individual intersections, improving the level of service on roadways and at intersections within the entire traffic network equates to less congestion and delay, and better air quality conditions within the project area.

6.3 Construction

Construction activities are a source of dust and exhaust emissions resulting from earth-moving and use of heavy equipment, land clearing, ground excavation, cut-and-fill operations, and the highway construction. Emissions can vary substantially day to day, depending on the level of activity, the specific operations, and the prevailing weather. A major portion of dust emissions for the proposed project would likely be caused by construction traffic on temporary areas. Construction of the proposed project would be phased to limit emissions and disruptions to the surrounding communities. Per St. George City Code, preparation of a dust control plan would be required to specify best practical methods that would be used to control the generation of fugitive dust, such as watering of construction areas, maintaining equipment, and minimizing idle time.

Construction and subsequent maintenance of the project would generate GHG emissions. Preparation of the roadway corridor (for example, earth-moving activities) involves a considerable amount of energy consumption and resulting GHG emissions; manufacture of the materials used in construction and fuel used by construction equipment also contributes GHG emissions. Typically, construction emissions associated with a new highway account for approximately 5 percent of the total 20-year lifetime emissions from the highway, although this can vary widely with the extent of construction activity and the number of vehicles that use the highway.

The addition of new highway miles to the study area highway network also would increase the energy and GHG emissions associated with maintaining those new highway miles in the future. The increase in maintenance needs from the addition of new highway infrastructure would be partially offset by the reduced need for maintenance on existing routes (because of lower total traffic and truck volumes on those routes).

6.4 Mobile Source Air Toxics

For each alternative in this EIS, the amount of MSATs emitted would be proportional to the VMT, assuming that other variables such as fleet mix are the same for each alternative. The VMT estimated for each of the action alternatives is slightly higher (less than 1 percent) than that for the No Action Alternative (i.e., the baseline scenario), because the additional capacity increases the efficiency of the Northern Corridor and attracts rerouted trips from elsewhere in the transportation network (Table 7). This minor increase in VMT would lead to slightly higher MSAT emissions for the action alternatives, along with a corresponding decrease in MSAT emissions along the parallel routes, primarily I-15, within the study area. The emissions increase is offset somewhat by lower MSAT emission rates due to increased speeds; according to the EPA MOVES2014 model, emissions of all of the priority MSAT decrease as speed increases. Because the estimated VMT under each of the alternatives are nearly the same, varying by less than 0.2 percent, it is expected there would be no appreciable difference in overall MSAT emissions among the various alternatives.

Table 7. Washington County Vehicle Miles Traveled

Year	Scenario	Daily VMT	Increase Above No Action	Variation per St. George Boulevard/100 South One-way Couplet Alternative	Evening Peak Period (4 to 6 p.m.) VMT	Increase Above No Action	Variation per St. George Boulevard/100 South One-way Couplet Alternative
2019	Existing	4,367,738	Not Applicable	Not Applicable	1,087,122	Not Applicable	Not Applicable
2050	No Action	10,287,036	Not Applicable	Not Applicable	2,557,253	Not Applicable	Not Applicable
2050	T-Bone Mesa Alignment	10,296,900	0.10%	0.06%	2,560,121	0.11%	0.06%
2050	UDOT Application Alignment	10,295,127	0.08%	0.04%	2,560,028	0.11%	0.06%
2050	Southern Alignment	10,291,067	0.04%	0.001%	2,559,754	0.10%	0.05%
2050	Red Hills Parkway Expressway	10,311,945	0.24%	0.20%	2,563,923	0.26%	0.21%
2050	St. George Boulevard/ 100 South One-way Couplet	10,290,984	0.04%	0%	2,558,499	0.05%	0%

Source: Horrocks Engineers 2020

Also, regardless of the alternative chosen, emissions would likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by more than 90 percent between 2010 and 2050 (FHWA 2016). Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area would likely be lower in the future in nearly all cases.

The new travel lanes contemplated as part of the action alternatives within the NCA (T-Bone Mesa Alignment, UDOT Application Alignment, and Southern Alignment) would have the effect of moving some traffic closer to nearby homes and businesses; therefore, under each action alternative, there may be localized areas where ambient concentrations of MSAT could be higher under certain action alternatives than the No Action Alternative. The localized increases in MSAT concentrations would likely be most pronounced along the T-Bone Mesa Alignment. However, the magnitude and the duration of these potential increases compared to the No Action Alternative cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific MSAT health impacts. MSAT concentrations along Red Hills Parkway Expressway and St. George Boulevard/100 South One-way Couplet alternatives would be similar to the No Action Alternative because improvements include a change in facility type but no roadway widening.

When a new highway is constructed, the localized level of MSAT emissions for the action alternatives could be higher relative to the No Action Alternative, but this could be offset by increases in speeds and reductions in congestion (which are associated with lower MSAT emissions). Also, MSAT would be lower in other locations when traffic shifts away from them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover will, over time, cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today. Localized increases in MSAT concentrations would be progressively less pronounced under the Southern Alignment, UDOT Application Alignment, and T-Bone Mesa Alignment, respectively.

Each of the action alternatives includes or connects to a new or modified interchange with an existing highway, which also has the potential for moving some traffic closer to nearby homes, parks, schools, and businesses; therefore, under each action alternative, there may be localized areas where ambient concentrations of MSAT could be higher under certain action alternatives than the No Action Alternative. The T-Bone Mesa Alignment, UDOT Application Alignment, Southern Alignment, and Red Hills Parkway Expressway action alternatives would all tie into and modify the North Bluff Street/Snow Canyon Parkway interchange on the western terminus. The St. George Boulevard/100 South One-way Couplet action alternative would tie in to the I-15/East St. George Boulevard interchange on its eastern terminus. The localized increases in MSAT emissions would likely be most pronounced along the new highway sections that would be built at these interchange locations. However, even if these increases do occur, they too would be substantially reduced in the future through implementation of EPA's vehicle and fuel regulations.

In summary, under all action alternatives in the 2050 design year, it is expected there would be reduced MSAT emissions in the immediate area of the project relative to the No Action Alternative as a result of improved operational speeds and less stop-and-go traffic (speeds of 0 to 25 miles per hour). In addition, the EPA MSAT reduction programs would likely reduce MSAT emissions for all action alternatives and the No Action Alternative.

6.5 Greenhouse Gases

GHG emissions from vehicles using roads are a function of distance traveled (expressed as VMT), vehicle speed, and road grade. Under the action alternatives, changes in land use due to employment and population increases lead to an increase in VMT relative to the No Action Alternative. However, under the action alternatives, VMT in

Washington County would increase by less than 1 percent compared to no action levels, resulting in a negligible increase in GHG emissions.

CO_2 accounts for 95 percent of transportation GHG emissions in the United States. The highest levels of CO_2 and GHGs by proxy from mobile sources such as automobiles occur at stop-and-go speeds (0 to 25 miles per hour) and speeds over 55 miles per hour; the most severe emissions occur from 0 to 25 miles per hour (Barth and Boriboonsomsin 2010). Speed limits along the project corridors range between 30 miles per hour (mph) and 55 mph. To the extent that a project relieves congestion by enhancing operations and improving travel times in high-congestion travel corridors, GHG emissions, particularly CO_2, may be reduced. Table 8 shows the current and estimated 2050 design year travel times on three existing routes connecting I-15 north of Exit 13 to West Sunset Boulevard. As shown in Table 8, travel times more than double and indicate that average vehicle speeds would substantially decrease relative to current conditions under the No Action Alternative. Although the action alternatives would improve traffic flow and reduce stop-and-go conditions relative to the No Action Alternative, potential reductions in CO_2 emissions and GHG emissions by proxy would be somewhat diminished if a higher percentage of vehicle traffic maintains a 55-mile-per-hour operating speed under free flow conditions.

Table 8. Current and Estimated Travel Times

Sunset Boulevard to I-15 North of Exit 13 Route	2019 Travel Time (minutes)	2050 Travel Time (minutes)
Bluff Street and St. George Boulevard (Route A)	14	24
Red Hills Parkway and Buena Vista Boulevard (Route B)	14	25
Red Hills Parkway and Green Spring Drive (Route C)	14	40

Source: Horrocks Engineers 2020

A major factor in mitigating increases in VMT is EPA GHG emissions standards, implemented in concert with national fuel economy standards. The U.S. Energy Information Administration projects that vehicle energy efficiency (and thus, GHG emissions) on a per-mile basis will improve by approximately 55 percent by 2050 (EIA 2020). This improvement in vehicle emissions rates is more than sufficient to offset the increase in VMT (Table 7).

6.5.1 Projection Scenarios

Per Utah Legislature, the Kem C. Gardner Policy Institute at the University of Utah published *The Utah Roadmap* report, which identified positive solutions to reduce air emissions and improve the climate and air quality for Utah (Gardner 2020). Based on the best available data, the Gardner Institute was able to graph current and projected levels of GHG emissions (Figure 8). As shown on Figure 8, the “Business as Usual” scenario considers population and energy demand increases where as the “Planned Reduction” scenario includes foreseeable emissions reductions from the closure of coal power plants and the increased use of electric vehicles. Existing annual GHG emissions for Utah are approximately 60 MMT CO_2e. Under the “Business as Usual” scenario, GHG emissions are projected to increase to approximately 95 MMT CO_2e by 2050, an increase of approximately 37 percent above current emissions. However, under the “Planned Reduction” scenario, GHG emissions are projected to decrease to approximately 32 MMT CO_2e by 2050, a decrease of approximately 66 percent below current emissions.

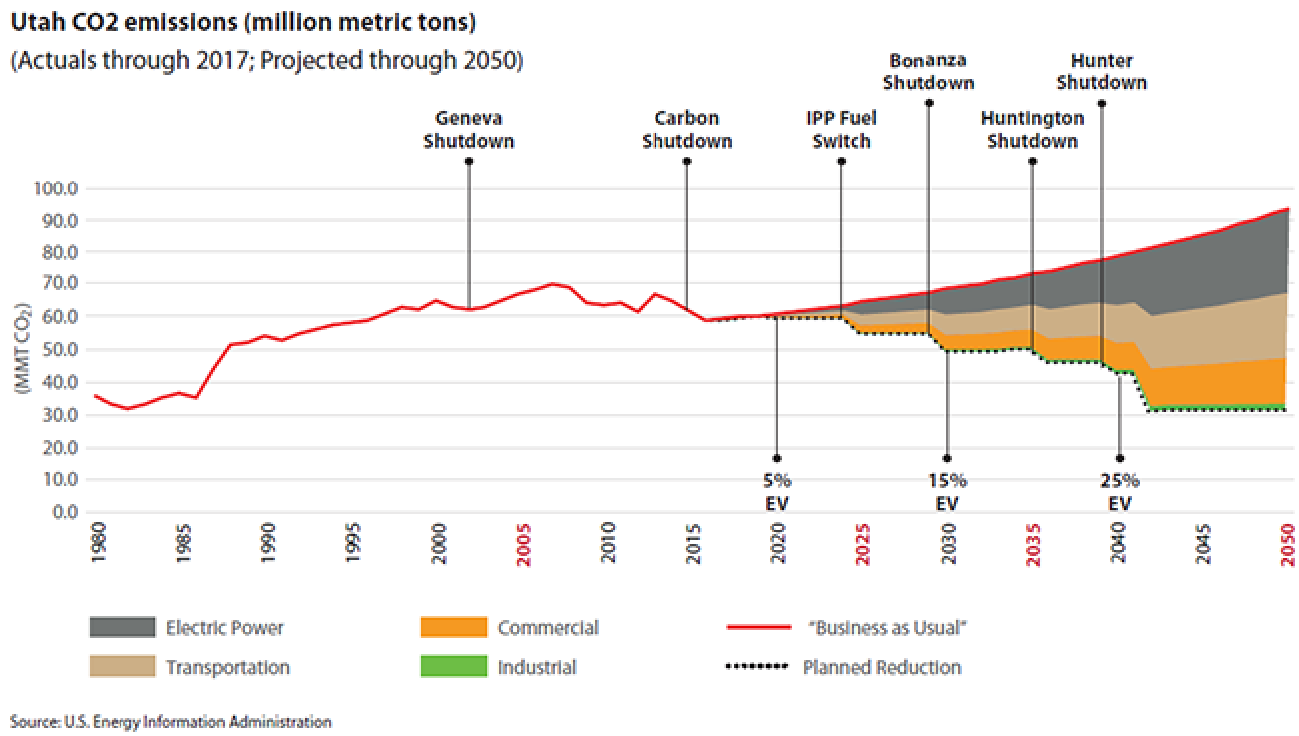

Figure 8. Utah CO_2 Emissions (million metric tons)

Source: Gardner 2020

The IPCC developed emissions scenarios, called Representative Concentration Pathways (RCP), used for impact and adaptation assessments. There are four RCP scenarios that project concentrations of GHGs by the year 2100 based on the amount of radiative forcing in watts per square meter (RCP2.6, RCP4.5, RCP6, and RCP8.5). Figure 9 depicts the four RCP scenarios through year 2100. Figure 10 depicts the range of warming projected with each RCP. Scenario RCP2.6 includes a stringent mitigation and is the representative scenario that aims to keep global warming likely below 2 °C above pre-industrial temperatures (IPCC 2014). However, global emissions in 2030 are on track to follow the RCP4.5 and RCP 6.0, resulting in a global warming of about 3 °C by 2100 (IPCC 2018).

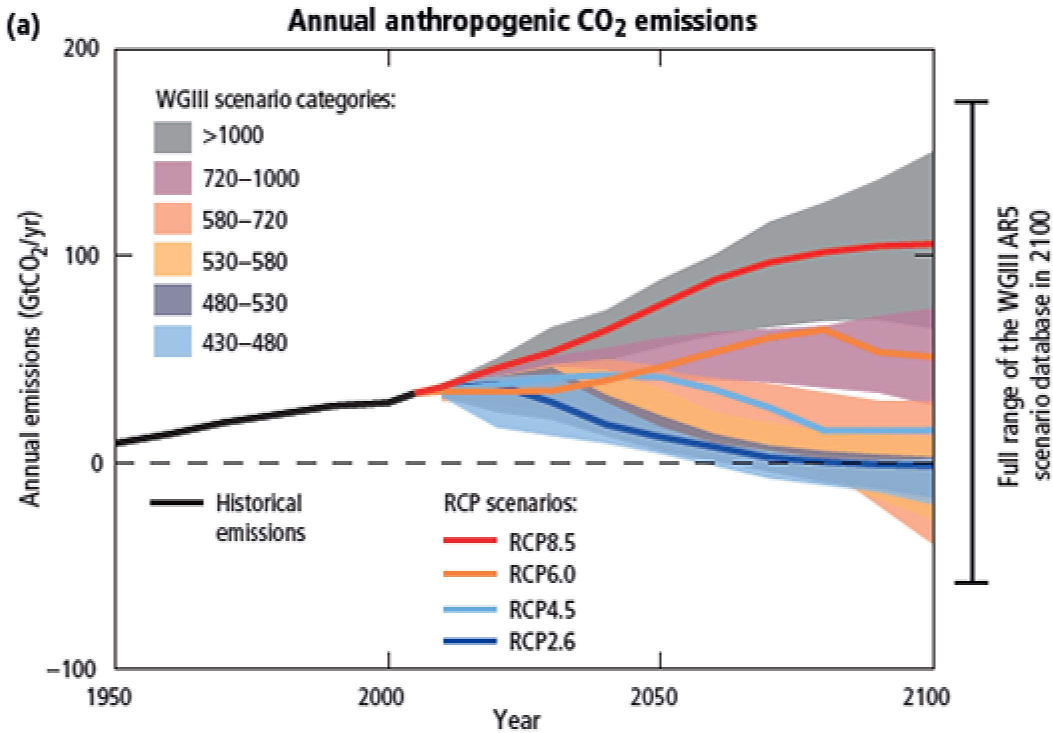

Figure 9. Annual Anthropogenic CO_2 Emissions

Source: IPCC 2014

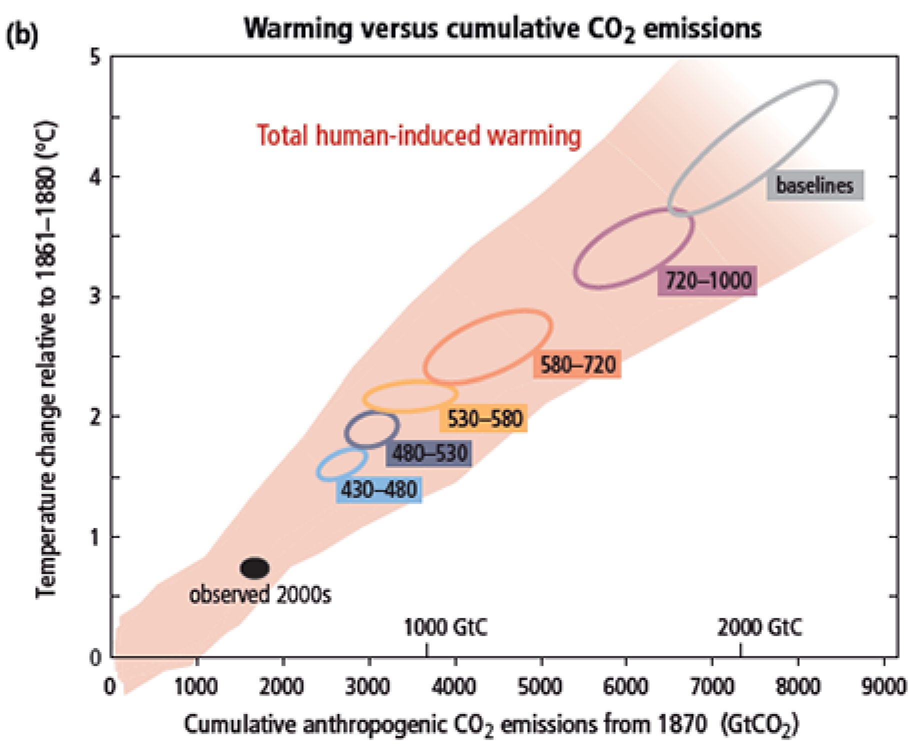

Figure 10. Warming versus Cumulative CO_2 Emissions

Source: IPCC 2014

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Appendix J: Highway Alternatives Development Technical Report

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Northern Corridor

Highway Alternatives Development Report

Final

October 2020

Prepared for:
U.S. Department of the Interior Bureau of Land Management
Fish & Wildlife Service

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Contents

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Acronyms and Abbreviations

BLM	Bureau of Land Management
CFR	Code of Federal Regulations
DMPO	Dixie Metropolitan Planning Organization
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FLPMA	Federal Land Policy and Management Act of 1976
I-15	Interstate 15
LOS	level of service
mph	miles per hour
NCA	National Conservation Area
NEPA	National Environmental Policy Act
OPLMA	Omnibus Public Lands Management Act of 2009
ROW	right-of-way
RTP	Regional Transportation Plan
TDM	travel demand model
UDOT	Utah Department of Transportation

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1. Introduction

The purpose of this report is to document the alternatives development process for the Northern Corridor highway alternatives in support of the *Northern Corridor – Highway Right-of-Way, Issuance of an Incidental Take Permit and Environmental Impact Statement (EIS) and Proposed Resource Management Plan (RMP) Amendments*. This report focuses specifically on the details of the alternative development process for the Northern Corridor highway, and describes the following:

- The background of the proposed Northern Corridor.
- The purpose and need and applicant's objectives for the proposed action.
- The process used to develop a reasonable range of alternatives that address the purpose and need, per the Council on Environmental Quality's implementing regulations for the National Environmental Policy Act (NEPA) at 40 Code of Federal Regulations (CFR) 1502.14.
- The alternatives considered and process used to compare the alternatives.
- The alternatives carried forward for detailed analysis in the EIS.

The purpose and need and description of the alternative development processes used for other Federal actions related to the proposed Northern Corridor are specifically discussed in Chapter 1 and Chapter 2 of the Northern Corridor EIS.

1.1 Background and Previous Studies

The Utah Department of Transportation (UDOT) applied to the Bureau of Land Management (BLM) for a right-of-way (ROW) grant on September 18, 2018, to construct a multi-lane, divided highway (referred to as the Northern Corridor) across the Red Cliffs National Conservation Area (NCA). The Red Cliffs NCA was designated by Congress through the Omnibus Public Land Management Act of 2009 (OPLMA) (16 USC 460www; Public Law 111-11, Title 1, Subtitle O, Section 1974). The Congressionally defined purpose of the 45,000-acre NCA is to conserve, protect, and enhance for the benefit and enjoyment of present and future generations the ecological, scenic, wildlife, recreational, cultural, historical, natural, educational, and scientific resources of the Red Cliffs NCA and to protect each species that is located in the NCA and listed as a threatened or endangered species under the Endangered Species Act. Section 1974 states that the NCA shall be managed by the Secretary of the Interior through the BLM and that the Secretary shall only allow uses of the NCA that the Secretary determines would further a purpose for which the NCA was designated.

OPLMA Subtitle O, Section 1977 also directs the Secretary to develop a comprehensive travel management plan for the land managed by the BLM in Washington County and, in accordance with the Federal Land Policy and Management Act of 1976 (FLPMA) (43 USC 1701 et seq.), "in developing the travel management plan, the Secretary shall—(A) in consultation with appropriate Federal agencies, State, tribal, and local governmental entities (including Washington County and St. George City, Utah), and the public, identify one or more alternatives for a northern transportation route in the County."

The BLM is considering several alternative northern transportation routes as part of the EIS in response to the UDOT ROW application.[1] The BLM is using the National Environmental Policy Act of

[1] The term "Northern Corridor" is a general reference to the concept of a corridor between Interstate 15 and Utah State Highway 18, while "northern transportation route" is the specific term of art connecting in Section 1977 of OPLMA. Although the terms "Northern Corridor," "northern transportation route," and ROW are used throughout the DEIS, UDOT's ROW application has not been designated the "Northern Corridor."

1969 (NEPA) process to, in addition to analyzing the potential impacts of the proposed ROW, evaluate if the ROW application is consistent with the statutory purposes of the Red Cliffs NCA and whether it is necessary to amend the Red Cliffs NCA RMP to accommodate a ROW, or deny UDOT's application. If the RMP is amended and the ROW is also granted, the BLM will then be able to identify that ROW as a specific northern transportation route (i.e. a Northern Corridor) as part of a future travel management planning process as Congress has instructed in Section 1977 of OPLMA.

Fully evaluating UDOT's ROW application and potential amendments to the Red Cliffs NCA RMP will also further the Department of the Interior's policy goals, as stated in the Strategic Plan for Fiscal Years 2018-2022, to "enhance conservation stewardship whereby all levels of government and private landowners work cooperatively together in an atmosphere of mutual respect to achieve shared natural resource management goals across landscapes" and to "[develop] and [maintain] strong partnerships with State, local, and private stakeholders in shared conservation stewardship." UDOT is seeking to meet the transportation demands of Washington County's anticipated continued growth through 2050 and Washington County is also seeking a renewed Incidental Take Permit in order to meet the needs of its increasing population. Washington County's current transportation infrastructure may not accommodate the County's projected growth, and it is trying to balance that future growth with the statutory and regulatory provisions governing the Red Cliffs NCA and larger Red Cliffs Desert Reserve (the Reserve), and the protected wildlife that resides on those lands.

The Red Cliffs NCA comprises 73 percent of the land base of a multi-jurisdictional, 62,000-acre reserve known locally as the Red Cliffs Desert Reserve (the Reserve). The Reserve was established in 1996 in connection with the U.S. Fish and Wildlife Service's (USFWS) approval of the County's Habitat Conservation Plan (HCP) for the threatened Mojave desert tortoise. Also in 1996, the USFWS issued an Incidental Take Permit (ITP) to the County for the take associated with otherwise lawful activities in the County. As a result of the ITP and protective management of the Reserve's land base by the respective land managing agencies, necessary development has been able to occur in tortoise habitat on non-Federal lands in the County.

Planning for the Northern Corridor has been ongoing for two decades and has been led by the Dixie Metropolitan Planning Organization (DMPO), the governmental agency responsible for regional transportation planning in Washington County. The DMPO has conducted these efforts in coordination with the County, the City of St. George, Washington City, City of Ivins, City of Santa Clara, City of Hurricane, UDOT, and other communities in the St. George and Hurricane urbanized area.

Through transportation plans, environmental documents, and various other studies, variations of an additional east-west route north of Red Hills Parkway have been studied as an option to provide another connection between the communities of Ivins, Santa Clara, and the western urbanized area of St. George to the west and Washington and Hurricane to the east. The highway has also been envisioned as an option to reduce traffic volumes on key corridors such as Bluff Street, Red Hills Parkway, and St. George Boulevard that are currently congested and are expected to experience worse congestion in the future as the Washington County population grows and the associated east-west travel demand increases. The proposed corridor has been referred to by various names, including the Northern Corridor, Great Northern Corridor, and the Washington Parkway. "Northern Corridor" is used throughout this document. The following list summarizes key studies that have been undertaken relating to the Northern Corridor and their outcomes or relevance to this study:

- *Washington Parkway Study: Integration of East-West Transportation Needs with Conservation Objectives for Desert Tortoise in Washington County, Utah* (2012): This study was prepared for the DMPO, UDOT, the County, City of St. George, and Washington City by Jacobs and Logan Simpson. The study addresses the perceived conflict between transportation and tortoise conservation, and supports the responsibilities of the local government entities, as identified in OPLMA (Public Law 111-11, Title 1, Subtitle O; March 30, 2009), to assist in the identification of a potential northern transportation route. This study does not identify a specific location for a new transportation route, nor does it provide specific solutions to tortoise and transportation issues on the Red Cliffs Desert Reserve (the Reserve). The study determines if there is justification for further evaluation of a transportation corridor that has as its primary objective conservation, protection, and enhancement of the tortoise and its habitat.

- *Washington County General Plan* (Amended 2012): The County's plan describes the need to identify one or more routes "making up a Northern Corridor" in response to OPLMA (Public Law 111-11, Title 1, Subtitle O). The Washington County Transportation Map displays four alternative routes as options for the Northern Corridor; they vary in location and are all identified as future arterials.
- *Red Hills Parkway State Route 18 (Bluff Street) to Industrial Road Environmental Assessment* (2009): UDOT analyzed options and potential environmental impacts, in compliance with NEPA, for the widening of Red Hills Parkway (formerly Skyline Drive). The Northern Corridor was analyzed as one of the alternatives in this study. In the study, the Northern Corridor was identified as a 3-lane roadway (in each direction), with an unpaved center median, beginning at Red Hills Parkway approximately 1 mile east of Bluff Street, continuing eastward through the Red Cliffs Desert Reserve, and connecting to Interstate 15 (I-15) at milepost 13. The Northern Corridor was eliminated from consideration because in 2009 the Northern Corridor did not meet the purpose and need to better accommodate east/west travel demand on Red Hills Parkway between Bluff Street and Industrial Road. The City of St. George, UDOT, and the Federal Highway Administration determined that the anticipated implementation challenges and the potential environmental effects, as previously described, would be substantial and thereby eliminated the Northern Corridor alternative from further consideration.
- *Washington Parkway Cost/Benefit Study* (2011): This study was performed by Horrocks Engineers for the DMPO, in conjunction with the County and UDOT. The study explored several alternative alignments for the Northern Corridor to determine which route would provide the greatest congestion relief on critical arterial roads in St. George and Washington City. For the study, the road in its entirety was referred to as the Washington Parkway, and was analyzed using the DMPO Regional Travel Demand Model (TDM). The model analyzed six alternatives and their ability to relieve congestion on the surrounding street network at the highest benefit for drivers in terms of congestion relief and travel time. The study also considered engineering design and construction feasibility to determine probable costs for the construction of the corridor. The study did not explicitly consider environmental issues or consequences of the proposed corridor alignments. The study determined that the T-Bone Mesa Alignment (called Option 3 in the study) provided the highest benefit relative to its cost with respect to traffic congestion relief.
- *Red Cliffs National Conservation Area Resource Management Plan* (2016): Completed by the BLM, the document analyzes all potential ROW within the NCA at a land management planning level and chooses an alternative management strategy that best achieves the purpose and requirements of the guiding legislation and regulations found in FLPMA and OPLMA. The Red Cliffs NCA RMP includes the Northern Corridor as a new ROW under Alternative D. Alternative D planned for a ROW to be granted within the NCA and higher intensity of access and resource use across the NCA. Alternative D was not chosen as the Preferred Alternative as it did not satisfy the planning and land management criteria set forth in guiding legislation and public scoping.
- DMPO Regional Transportation Plan: The Northern Corridor is identified in the DMPO's Regional Transportation Plan (RTP). It is listed as project number 68—a Phase 1 project (2019–2029)—for the construction of the first two lanes of the proposed roadway. It is also listed as project number 82—a Phase 2 project (2020–2030)—for the construction of the remaining two lanes.

2. Purpose and Need for Right-of-way Application

UDOT has applied for a ROW to construct a multi-lane, divided highway on BLM-administered lands within the Red Cliffs NCA and the overlapping Red Cliffs Desert Reserve with the objective of reducing congestion, increasing capacity, and improving east-west mobility on arterial and interstate roadways between State Route 18 (SR 18) and I-15 at milepost 13. In accordance with and taking into account the provisions of OPLMA and Department of the Interior policies, the BLM's purpose and need for action is to respond to UDOT's application for a ROW grant under Title V of FLPMA, BLM's ROW regulations, 43 CFR part 2800, and other applicable Federal laws. In the EIS, the BLM considers the potential impacts of the proposed ROW (Alternative 3, as described in Chapter 2 of the EIS; referred to herein as the UDOT Application Alignment) and reasonable alternatives. At the conclusion of the NEPA process, the BLM will decide whether to approve, approve with modifications, or deny issuance of a ROW grant to UDOT for the Northern Corridor and whether to approve an amendment to the RMP.

In particular, under OPLMA Subtitle O, Section 1977, the BLM is required to develop a comprehensive travel management plan for the land managed by the BLM in Washington County and, in doing so, to "identify one or more alternatives for a northern transportation route" in the county. In 2016, as part of developing the current Red Cliffs NCA RMP, BLM considered an alternative that included a Northern Corridor in the NCA. However, at that time, BLM did not have a specific ROW application to consider as part of that planning process. Instead, the BLM relied on several conceptual alignments from the Dixie Metropolitan Planning Organization that were based on Washington County's, a cooperating agency in developing that RMP, recommendations. While the BLM eventually selected a different alternative that did not include a corridor, the selected alternative did create an avoidance area that could accommodate a Northern Corridor alignment in the NCA. Under the 2016 RMP, an avoidance area is an area identified through resource management planning to be avoided but that may be available for ROW location with special stipulations.

The BLM has now received a specific ROW application from UDOT. The ROW application is designed to address the growing population and transportation needs in Washington County. However, the application seeks a ROW in the NCA that is larger than the current avoidance area can accommodate and, thus, cannot be granted without also amending the Red Cliffs NCA RMP.

Responding to UDOT's ROW application also furthers the Department of the Interior's policy goals, as stated in the Strategic Plan for Fiscal Years 2018-2022, to "enhance conservation stewardship whereby all levels of government and private landowners work cooperatively together in an atmosphere of mutual respect to achieve shared natural resource management goals across landscapes" and to "[develop] and [maintain] strong partnerships with State, local, and private stakeholders in shared conservation stewardship." UDOT is seeking to meet the transportation demands of Washington County's anticipated continued growth through 2050. Washington County's current transportation infrastructure may not accommodate the County's projected growth, and it is trying to balance that future growth with the statutory and regulatory provisions governing the Red Cliffs NCA and larger Red Cliffs Desert Reserve, and the protected wildlife that resides on those lands.

2.1 Right-of-Way Applicant's Objectives and Transportation Need

UDOT submitted a ROW application for construction, operation, and maintenance of a new highway with the objective of reducing congestion, increasing capacity, and improving east-west mobility on arterial and interstate roadways between SR 18 and I-15 at milepost 13. This objective is driven by the current and forecasted population growth within the county, which will continue to increase demand on the transportation network. Currently, the existing transportation network between SR 18 and I-15 is not adequate to meet future (2050) travel demand in the northeastern and northwestern areas of St. George based on traffic projections from the DMPO's Regional TDM (Horrocks Engineers 2020a).

The transportation need for the applicant's proposed action is the result of the growing population and increased future travel demand on the transportation system within the northern City of St. George, Washington City, City of Santa Clara, and the City of Ivins metropolitan areas, hereinafter referred to as the St. George urbanized area, and is what the proposed action is intended to address. The need for the applicant's proposed action is based on the following transportation deficiencies and is further described below:

- Lack of east-west corridors that cross within the St. George urbanized area, resulting in travel delay and decreased mobility.
- Increased traffic congestion along key regional roadways, including Red Hills Parkway, St. George Boulevard, and Bluff Street.
- Increased traffic congestion and decreased mobility at key intersections and interchanges within the St. George urbanized area.

2.1.1 Regional Travel Demand Model Overview

The following summarizes key aspects of the travel modeling conducted for the Northern Corridor project; further details are included in the Northern Corridor Traffic Analysis Memorandum (Horrocks Engineers 2020a). The transportation need is based on future travel demand forecasts for the county that were developed using the DMPO TDM. The TDM predicts future travel demand based on projections of land use, socioeconomic patterns, and transportation system characteristics. At the time of this study, the DMPO official version of the TDM is 3.0, which is calibrated to represent 2019 base-year travel conditions and projects traffic out to 2050 (Horrocks Engineers 2020a).

Specific inputs to the model include socioeconomic forecasts and transportation system data. For the DMPO TDM, the Washington County area was divided into roughly 850 smaller geographical parts called traffic analysis zones, which are populated with socioeconomic data used for trip generation. The socioeconomic data includes population, households, employment, and average household income. The transportation system data includes both roadway and transit networks. The roadway network includes freeways, arterial routes, and collector routes. The transit network includes local bus routes.

Existing socioeconomic and transportation system data were used to create a base-year (2019) model. Future year (2050) forecasts were prepared by running the model using future year socioeconomic and transportation system data.

Deficiencies in the St. George urbanized area were identified by comparing the present (2019) and future (2050) transportation conditions assuming that the Northern Corridor is not built but all other transportation improvements as identified in the DMPO RTP (DMPO 2019) have been implemented.

2.1.2 Washington County Population

Population and employment forecasts used in the DMPO TDM come from The University of Utah's Gardner Policy Institute, which provides demographic information for the Utah State Legislature and Office of the Governor. The county-level forecasts from the Gardner Policy Institute were then distributed at a city level by the DMPO using land use plans, information provided by local community planners, and growth trends. It is forecasted that during the next 30 years the population in Washington County will more than double, with heavy growth expected in Hurricane, St. George's south block area, Washington

City Fields area, Santa Clara, and Ivins. Table 1 shows the population of the cities in Washington County between 2010 and 2050 (Horrocks Engineers 2020a).

Table 1. City Population Growth in Washington County

City	2010	2020	2030	2040	2050
Apple Valley	712	841	1,152	1,470	1,805
Enterprise	1,900	2,206	2,480	3,165	3,886
Hildale	2,812	3,074	4,546	5,803	7,124
Hurricane	12,697	17,820	26,565	36,990	51,090
Ivins	6,912	11,940	14,867	17,396	20,580
La Verkin	3,844	4,607	5,285	6,747	8,283
Leeds	854	1,023	1,381	1,929	2,551
New Harmony	261	313	422	538	661
Rockville	249	298	402	514	631
Santa Clara	6,182	8,204	11,732	14,975	18,385
Springdale	571	685	924	1,179	1,448
St. George	74,837	96,543	125,576	156,489	177,692
Toquerville	1,061	1,272	2,248	3,311	9,274
Unincorporated	5,250	6,294	8,490	10,837	13,305
Virgin	659	732	864	1,103	1,355
Washington	17,921	28,270	41,509	54,421	68,296
County Total	**136,721**	**184,122**	**248,443**	**316,867**	**386,364**

Source: Horrocks Engineers 2020a

2.1.3 East-to-West Travel Demand

East-west travel demand was analyzed using "districts," which are combinations of several traffic analysis zones that are created to be able to evaluate travel characteristics of larger areas. Using the model's output for 2019 and 2050, travel demand between District 1 (Ivins, Santa Clara, west St. George, and the Ledges area) and the surrounding districts was compared to determine, at a higher level, the expected increase in east-west travel demand across the county between 2019 and 2050 (see Figure 1 in Attachment 1 for details). As shown on Figure 1, the travel demand between District 1 and the surrounding areas is expected to increase at a similar rate to the population increase with travel demand nearly doubling over the next 30 years (Horrocks Engineers 2020a).

2.1.4 Intersection Operations

An intersection operational analysis was conducted to determine how future growth would be expected to impact traffic operations at various intersections and interchanges within the St. George urbanized area. The primary measure of effectiveness used for the intersection operational analysis was Level of Service (LOS), a term used to describe the traffic operations of an intersection based on congestion and delay. LOS ranges from A (almost no congestion or delay) to F (traffic demand exceeds capacity and the intersection experiences long delay). LOS D is generally acceptable for urbanized intersections.

Using the results of the 2019 evening peak hour intersection volumes and the DMPO TDM, evening peak hour intersection volumes for 2050 were developed and then used to determine the LOS for each intersection. Full details of the traffic analysis results are contained in the Traffic Analysis Memorandum (Horrocks Engineers 2020a). Based on the intersection analysis, Table 2 indicates key intersections within the St. George urbanized area expected to experience failing operations, with LOS E or F, by 2050.

Table 2. Intersections Experiencing Failing Operations (2050)

Intersection	Traffic Volume	Total Delay (averaged) (second)	LOS	Max Queue (feet)
Sunset Boulevard/Bluff Street	5,594	79	F	2,398
Bluff Street/St. George Boulevard	6,158	139	F	-4,612
Red Hills Parkway/1000 East	3,050	214	F	-3,630
Green Spring Drive/Telegraph Street	7,411	82	E	1,316

Source: Horrocks Engineers 2020a

Based on the no action 2050 traffic analysis, most of the issues are centered around the primary east-west corridors of Red Hills Parkway, St. George Boulevard, Bluff Street, and Green Spring Drive, and the primary intersections that access these routes (Table 2). The 1000 East and Red Hills Parkway intersection experienced the highest degree of congestion with queues that extended nearly 1 mile. Congested conditions at several intersections restrict traffic so other intersections that appear to be operating at an acceptable LOS may only be doing so because they do not experience the full travel demand as a result of upstream congestion that limits the amount of traffic that can access these intersections.

3. Alternative Development

Per the BLM NEPA Handbook H-1790-1, “In determining the alternatives to be considered, the emphasis is on what is ‘reasonable’ rather than on whether the proponent or applicant likes or is itself capable of implementing an alternative. ‘Reasonable alternatives include those that are *practical* or *feasible* from the technical and economic standpoint and using common sense, rather than simply *desirable* from the standpoint of the applicant’” (BLM 2008).

When preparing an EIS, the BLM analyzes a range of reasonable alternatives, including those that are technically and economically practical or feasible and that satisfy the purpose and need of the proposed action. The BLM may eliminate an action alternative from detailed analysis if one or more of the following is true:

1) It does not respond to the purpose and need.
2) It is not technically or economically feasible.
3) It is not consistent with the overall policy objectives for the area.
4) Its implementation is remote or speculative.
5) It is not substantively different in design from an alternative being analyzed in detail.
6) It would have substantively similar effects from an alternative being analyzed in detail.

A reasonable range of alternatives has been developed, per 40 CFR 1502.14, including the No Action Alternative, the applicant’s proposed alternative, and additional action alternatives that vary from the applicant’s proposal. Northern Corridor alternatives were developed as the range of alternatives for consideration based on previous planning studies; through collaborative discussions with the interdisciplinary planning team including traffic engineers, roadway design engineers, environmental resource specialists, and agency stakeholders; and through input from cooperating agencies and the public during the public scoping period.

3.1 Scoping

The BLM and USFWS received public and agency input during the scoping process that was used in the development of the Northern Corridor alternatives. The public scoping process is described in more detail in the Northern Corridor Scoping Report (Horrocks Engineers 2020b); it began December 5, 2019, and extended through January 6, 2020. A public scoping meeting was held in St. George, Utah, on December 17, 2019. A total of 17,258 submissions were received from the public during the scoping period, many of which specifically provided suggestions for alternatives to consider or posited questions about the alternative development process. Public input on alternatives has been considered as part of the alternative development and planning process.

3.2 Agency Coordination

Input from the community, local governments, and State and Federal agencies was critical in identifying, refining, and evaluating preliminary alternatives to meet the transportation purpose and need. Input was collected through various methods including holding a public scoping meeting and meeting with representatives from the cooperating agencies. A number of State agencies, including the Utah Division of Wildlife Resources, provided data and input that assisted the development of alternatives. The State of Utah, Utah School and Institutional Trust Lands Administration, the County, DMPO, City of St. George, City of Ivins, Washington City, City of Hurricane, and Santa Clara City were involved as formal cooperating agencies to this planning process and development of preliminary alternatives.

Preliminary alternatives were presented at a cooperating agency meeting held on January 28, 2020, in St. George, Utah. Updates were provided to cooperating agencies following this meeting based on additional refinement of alternatives, and the project team sought input from these agencies throughout the alternative development process. The Northern Corridor Scoping Report (Horrocks Engineers 2020b) and Chapter 4 of the EIS provide additional detail on consultation and coordination related to this planning process.

4. Alternatives Considered

Thirteen Northern Corridor alternatives were developed as part of the range of alternatives and are described below. Each alternative was developed at a conceptual design level using the best available topographical and design-related information. Elements (for example, exact locations and sizes of bridges, culverts, cut/fill slopes, and retaining walls) were not specifically determined for each alternative. Horizontal and vertical design elements met applicable Federal, State, and local design standards. Sufficient engineering evaluation was applied to ensure that the alternatives could be constructed within the identified corridor widths.

If an alternative did not meet one or more of the BLM's criteria to move forward, it was eliminated from further analysis in the EIS. For several alternatives, additional analysis was needed to assess if the alternative met the BLM's criteria. To assist the planning team with this determination, analysis was done to verify each alternative's technical and economic feasibility, substantial differences in design between alternatives, and key effects to environmental resources. The BLM identified several alternatives that do not meet the criteria for alternatives to be analyzed in detail, as described herein and in Section 5.2.2.

The No Action Alternative was retained as a basis of comparison and is also described herein.

4.1 No Action Alternative

Under the No Action Alternative, the BLM would deny UDOT's application for a ROW grant across public lands in the Red Cliffs NCA for the Northern Corridor and the existing management of the NCA would remain unchanged. The No Action Alternative is required by NEPA and serves as a baseline against which to compare the environmental consequences that could be associated with implementation of other alternatives. In determining the transportation need, the No Action Alternative reflects all the roadway and transit improvements in the DMPO RTP (DMPO 2019), absent the Northern Corridor.

4.2 Northern Alignment (North of Cottonwood Wilderness Area)

Because this alternative crosses BLM-administered public lands, the BLM's action would be the issuance of a ROW grant to UDOT for the construction, operation, and maintenance of the Northern Corridor and subject to the terms and conditions as determined by the BLM. For the purposes of the alternative development process, this alternative was assumed to have a 500-foot ROW width. This alternative proposes a 50-mile per hour (mph) 4-lane, divided highway with two, 12-foot-wide travel lanes in each direction, 8-foot shoulders, a 20-foot center median, and a 10- to 14-foot-wide multi-use trail accommodating bicyclists and pedestrians (UDOT 2018). The Northern Alignment would cross the Red Cliffs NCA and Dixie National Forest north of the Cottonwood Wilderness Area (Figure 2). Under the Northern Alignment, the BLM would issue a ROW grant to UDOT for the portion of the alignment that crosses the Red Cliffs NCA. The highway would connect to the I-15/Leeds exit and SR 18 with either existing or new grade-separated interchanges.

The Northern Alignment was evaluated through the transportation and resource analysis to determine if the alignment met the BLM's criteria for moving forward for detailed analysis; specifically, if it was technically and economically feasible and if its effects differed from the other Northern Corridor alternatives, as described in Section 5.

4.3 Twist Hollow Alignment (Northern T-Bone)

Because this alternative crosses BLM-administered public lands, the BLM's action would be the issuance of a ROW grant to UDOT for the construction, operation, and maintenance of the Northern Corridor and subject to the terms and conditions as determined by the BLM. For the purposes of the alternative development process, this alternative was assumed to have a 500-foot ROW width. This alternative proposes a 50-mph 4-lane, divided highway with two, 12-foot-wide travel lanes in each direction, 8-foot shoulders, a 20-foot center median, and a 10- to 14-foot-wide multi-use trail accommodating bicyclists and pedestrians (UDOT 2018). The Twist Hollow Alignment came from agency input as part of the alternative development process and is a northern variation to the location of T-Bone Mesa Alignment. Under the Twist Hollow Alignment, the BLM would issue a ROW grant to UDOT for the portion of the alignment crossing the Red Cliffs NCA. This alignment would cross the Red Cliffs NCA north of T-Bone Mesa. It would connect with I-15 at milepost 16 on the east and with SR 18 on the west, approximately 1.5 miles north of the Red Hills Parkway/Snow Canyon Parkway interchange. The alignment was developed to be located as far north as possible in the Red Cliffs NCA while still connecting to I-15 and Bluff Street at locations closer to the urbanized areas to increase the corridor's transportation use.

The Twist Hollow Alignment was not carried forward for detailed analysis in the EIS. The Twist Hollow Alignment only partially meets the BLM's purpose and need. Although the location may address some resource conflicts with the Mojave desert tortoise, it would be less effective than other alternatives at meeting the purpose and need to provide for consistency with the statutory purposes of the Red Cliffs NCA, which includes other ecological and scenic resources. Discussions with BLM and USFWS biologists indicate that the Twist Hollow area is a highly sensitive and diverse biological area for many species besides the Mojave desert tortoise and would likely result in comparatively more effects to wildlife and sensitive species than to similar alternatives carried forward for detailed analysis in the EIS.

4.4 T-Bone Mesa Alignment

Because this alternative crosses BLM-administered public lands, the BLM's action would be the issuance of a ROW grant to UDOT for the construction, operation, and maintenance of the Northern Corridor and subject to the terms and conditions as determined by the BLM. For the purposes of the alternative development process, this alternative was assumed to have a 500-foot ROW width. This alternative proposes a 50-mph 4-lane, divided highway with two, 12-foot-wide travel lanes in each direction, 8-foot shoulders, a 20-foot center median, and a 10- to 14-foot-wide multi-use trail accommodating bicyclists and pedestrians (UDOT 2018).

Under the T-Bone Mesa Alignment, the BLM would issue a ROW grant to UDOT for the portion of the alignment that crosses the Red Cliffs NCA. This alignment would connect Green Spring Drive on the east to Red Hills Parkway on the west just north of the Pioneer Hills trailhead parking area. It is assumed that the City of St. George would pursue a FLPMA Title V ROW amendment with the BLM for the tie-in location to Red Hills Parkway on public lands. Under this alternative, the Northern Corridor would skirt the southern edge of T-Bone Mesa (Figure 2). The Northern Corridor would be approximately 4.2 miles long, approximately 2.2 of which would be across BLM-administered lands.

The T-Bone Mesa Alignment was evaluated through the transportation and resource analysis to determine if the alignment met the BLM's criteria for moving forward for detailed analysis; specifically, if it was technically and economically feasible and if its effects differed from the other Northern Corridor alternatives, as described in Section 5 below.

4.5 UDOT Application Alignment

Because this alternative crosses BLM-administered public lands, the BLM's action would be the issuance of a ROW grant to UDOT for the construction, operation, and maintenance of the Northern Corridor and subject to the terms and conditions as determined by the BLM. For the purposes of the alternative development process, this alternative was assumed to have a 500-foot ROW width. This alternative proposes a 50-mph, 4-lane, divided highway with two, 12-foot-wide travel lanes in each direction, 8-foot shoulders, a 20-foot center median, and a 10- to 14-foot-wide multi-use trail accommodating bicyclists and pedestrians (UDOT 2018).

Under the UDOT Application Alignment, the BLM would issue a ROW grant to UDOT for the portion of the alignment that crosses the Red Cliffs NCA. This alignment would connect Green Spring Drive on the east to Red Hills Parkway on the west just north of the Pioneer Hills trailhead parking area. It is assumed that the City of St. George would pursue a FLPMA Title V ROW amendment with the BLM for the tie-in location to Red Hills Parkway on public lands. Under this alternative, the Northern Corridor would be approximately 4.5 miles long, approximately 1.9 of which would be across BLM-administered lands (Figure 2).

The UDOT Application Alignment was evaluated through the transportation and resource analysis to determine if the alignment met the BLM's criteria for moving forward for detailed analysis; specifically, if it was technically and economically feasible and if its effects differed from the other Northern Corridor alternatives, as described in Section 5.

4.6 Southern Alignment

Because this alternative crosses BLM-administered public lands, the BLM's action would be the issuance of a ROW grant to UDOT for the construction, operation, and maintenance of the Northern Corridor and subject to the terms and conditions as determined by the BLM. For the purposes of the alternative development process, this alternative was assumed to have a 500-foot ROW width. This alternative proposes a 50-mph, 4-lane, divided highway with two, 12-foot-wide travel lanes in each direction, 8-foot shoulders, a 20-foot center median, and a 10- to 14-foot-wide multi-use trail accommodating bicyclists and pedestrians (UDOT 2018).

Under the Southern Alignment, the BLM would issue a ROW grant to UDOT for the portion of the alignment that crosses the Red Cliffs NCA. The Southern Alignment would skirt the southern border of the NCA, connecting Green Spring Drive on the east to Red Hills Parkway on the west just north of the Pioneer Hills trailhead parking area (Figure 2). It is assumed that the City of St. George would pursue a FLPMA Title V ROW amendment with the BLM for the tie-in location to Red Hills Parkway on public lands. The Northern Corridor would be approximately 5.5 miles long, approximately 1.5 of which would be across BLM-administered lands.

The Southern Alignment was evaluated through the transportation and resource analysis to determine if the alignment met the BLM's criteria for moving forward for detailed analysis; specifically, if it was technically and economically feasible and if its effects differed from the other Northern Corridor alternatives, as described in Section 5.

4.7 Widen Red Hills Parkway to Six Lanes

This alternative would not require BLM to issue a ROW grant to UDOT across the Red Cliffs NCA. It would, however, necessitate that the BLM make any necessary ROW amendments to the existing FLPMA Title V ROW for the Red Hills Parkway. This alternative would widen Red Hills Parkway from four to six lanes between the Bluff Street and Green Spring Drive intersection and would widen Buena Vista Boulevard from two to six lanes between Green Spring Drive and Washington Parkway (Figure 2). It would also include improvements to existing intersections within these limits such as adding exclusive right- and/or left-turn lanes. Speed limits along Red Hills Parkway would be 40 to 50 mph.

The Widen Red Hills Parkway to Six Lanes Alternative was evaluated through the transportation and resource analysis to determine if the alignment met the BLM's criteria for moving forward for detailed analysis; specifically, if it was technically and economically feasible and if its effects differed from the other alternatives, as described in Section 5.

4.8 Red Hills Parkway Expressway

The Red Hills Parkway Expressway alternative proposes changes to Red Hills Parkway instead of a new road across BLM-administered lands within the NCA (Figure 2). This alternative assumes that the BLM would not issue UDOT a ROW grant across the Red Cliffs NCA for the Northern Corridor. Rather, the BLM would need to grant necessary ROW amendments to the City of St. George's existing FLPMA Title V ROW for the Red Hills Parkway. This alternative would convert Red Hills Parkway into a grade-separated expressway between I-15 and Bluff Street. Improvements would include new east-to-north and south-to-west connections to I-15 to connect Red Hills Parkway directly to I-15, including an additional lane in each direction extending most of the length between 200 East and 900 East. The alternative would also convert the existing at-grade signalized intersections at 200 East (Skyline Drive) and 1000 East to grade-separated interchanges with necessary modifications to the mainline roadway to accommodate the new interchanges. New flyover ramps would be constructed to connect Red Hills Parkway to I-15.

The intersections at 900 East and Industrial Road would be closed and/or converted to right-in-right-out movements only because of their proximity to the 1000 East interchange and the I-15 flyover ramps. The intersection at Highland Drive would be closed. Existing driveways along the existing roadway to public and private properties would either be closed or converted to right-in-right-out movements only; all left turns in and out would be prohibited.

Additional widening of Red Hills Parkway at various locations between 200 East and 900 East would be required to add exclusive turn lanes for access to individual properties and/or public use areas where feasible. Section 3.26 of the main EIS details these areas requiring widening and lists the partial and full acquisitions and changes in access that would be required to accommodate the widening. The existing pedestrian trail along Red Hills Parkway would be relocated in various locations between 200 East and 900 East to accommodate improvements including lengthening of the existing pedestrian tunnel under Red Hills Parkway in the Pioneer Park area. The speed limit with the expressway alternative would be from 45- to 50-miles per hour.

The Red Hills Expressway was evaluated through the transportation and resource analysis to determine if the alignment met the BLM's criteria for moving forward for detailed analysis; specifically, if it was technically and economically feasible and if its effects differed from the other Northern Corridor alternatives, as described in Section 5.

4.9 Widen St. George Boulevard

The Widen St. George Boulevard Alternative assumes that the BLM would not issue UDOT a ROW grant across the Red Cliffs NCA. St. George Boulevard is currently two lanes in each direction; this alternative would widen the roadway by approximately 24 feet to expand the road to three lanes in each direction between Bluff Street and River Road. Additional improvements to existing intersections and property accesses would be required to accommodate this alternative. Speed limits along St. George Boulevard would remain at 35 mph as they currently are (Figure 2).

The Widen St. George Boulevard Alternative was evaluated through the transportation and resource analysis to determine if the alignment met the BLM's criteria for moving forward for detailed analysis; specifically, if it was technically and economically feasible and if its effects differed from the other Northern Corridor alternatives, as described in Section 5.

4.10 St. George Boulevard/100 South One-way Couplet

The One-way Couplet Alternative proposes changes to existing St. George Boulevard and 100 South instead of a new road across BLM-administered lands within the NCA (Figure 2). This alternative assumes that the BLM would not issue UDOT a ROW grant across the Red Cliffs NCA for the Northern Corridor. Rather, the alternative would include modifications to St. George Boulevard and 100 South to respond to future transportation demands in Washington County. The two roadways would be converted into a one-way couplet system between I-15 and Bluff Street, where St. George Boulevard would only accommodate westbound traffic and 100 South would only accommodate eastbound traffic. St. George Boulevard would be converted from its existing two lanes in each direction (with a raised center median and turn pockets) to three westbound lanes. Modifications to the cross streets between I-15 and Bluff Street would disallow eastbound left and right turns from the cross streets. Similarly, 100 South would be converted from its existing one lane in each direction, with a center turn lane, to three eastbound lanes. Modifications to the intersections at cross streets between I-15 and Bluff Street would disallow westbound left and right turns from the cross streets. There may also be other minor reconstructions to storm drain and utility systems that would be required to safely convert these streets to one-way operations.

On St. George Boulevard, the raised and landscaped medians and irrigation systems would be removed and the median lighting would be replaced/relocated to the sides of the road. In addition, the Diverging Diamond Interchange at I-15/St. George Boulevard would be reconfigured to a more conventional diamond intersection configuration. On 100 South, the center two-way-left-turn median and shoulders would be reconfigured.

In addition, the existing interchange with I-15 at St. George Boulevard would be reconfigured and combined with a new interchange at 100 South to provide a split interchange system between these two roadways connected by one-way ramps. Southbound I-15 traffic would exit I-15 at St. George Boulevard and enter I-15 from 100 South. Similarly, northbound I-15 traffic would exit I-15 at 100 South and enter I-15 from St. George Boulevard. Speed limits would be 35-miles-per-hour along St. George Boulevard and 30- to 35-miles-per-hour along 100 South, depending on location.

The St. George Boulevard/100 South One-way Couplet Alternative was evaluated through the transportation and resource analysis to determine if the alignment met the BLM's criteria for moving forward for detailed analysis, specifically if it was technically and economically feasible and if its effects differed from the other Northern Corridor alternatives, as described in Section 5.

4.11 Increased Use of Mass Transit

Comments received during the scoping process suggested the increased use of mass transit as a Northern Corridor alternative for consideration. Transit usage in the St. George urbanized area is currently limited by the size of the area, the number of routes, and the locations served. With full implementation of the transit improvements shown in the DMPO RTP, 2050 transit use accounts for less than 1 percent of all trips (DMPO 2019). Based on local planning and available funding, it is unreasonable to assume the St. George urbanized area could develop a robust transit system within the planning horizon represented by the EIS that would eliminate a substantial amount of vehicle trips from the transportation system. The Increased Use of Mass Transit Alternative would be substantially similar to the No Action Alternative and was not carried forward for detailed analysis in the EIS.

4.12 Active Transportation

Comments received during the scoping process suggested active transportation including pedestrian and bicycle facilities, as a Northern Corridor alternative for consideration. Non-motorized travel in the St. George urbanized area represents a miniscule amount of all travel and is insignificant when it comes to serving the area's transportation needs. The Active Transportation Alternative would not meet the future east-west travel demand and reduce future intersection congestion within the St. George urbanized area and would be substantially similar to the No Action Alternative. This alternative was not carried forward for detailed analysis.

4.13 Land Use/Growth Regulation

Comments received during the scoping process suggested limiting development in Washington County, or setting growth regulations as a Northern Corridor alternative for consideration. Land use planning, including existing and planned development, is controlled by the local municipalities within Washington County as outlined in city general planning documents. Limiting development in Washington County, or setting growth regulations, is inconsistent with current local government general land use and zoning plans. The Land Use/Growth Regulation Alternative would be inconsistent with the managing objectives of the local municipalities over land use planning and its implementation is remote or speculative. Therefore, the alternative has been eliminated from detailed analysis in the EIS.

4.14 Conserve Southwest Utah Community Transportation Alternative(s)

During the scoping process, the nonprofit organization Conserve Southwest Utah presented its proposed "Community Transportation Alternative," which includes the following alternatives, ranging from roadway, land use, and transit to active transportation options:

- Alternative 1: Red Hills Parkway – I-15 Viaduct/Flyover Connection.
- Alternative 2: Improvements to Red Hills Parkway between I-15 Exits 8 and 13.
- Alternative 3: More Porous I-15 to Move Traffic North-South around Congestion Areas. This sub-alternative suggests new I-15 underpass crossings on 400 East, 700 East and 1240 East.
- Alternative 5: Implement/Plan for Technological Improvements (i.e., traffic management using technology).
- Alternative 6: Implement Congestion Reduction Land Use Principles (Vision Dixie).
- Alternative 7: Downtown St. George Loop.
- Alternative 8: Address Moving People Rather than Vehicles Transit Options.
- Alternative 9: Long-term Thru-Traffic St. George Bypass.
- Alternative 10: Industrial Park Reuse.

Several of the alternatives suggested as part of the Conserve Southwest Utah's Community Transportation Alternative are similar to other alternatives that have been considered as part of the alternative development in the planning process for the EIS. Based on the following conclusions, the Community Transportation Alternative has been eliminated from detailed analysis in the EIS:

- Alternatives 1, 2, and 7 include suggested roadway projects that are being considered as standalone Northern Corridor alternatives, including the Red Hills Parkway Expressway, Widen Red Hills Parkway Alternative, and the St. George/100 South One-way Couplet Alternative, as previously described.
- Land use planning, including existing and planned development, is controlled by the local municipalities within Washington County as outlined in each city's general planning documents. Alternatives 5, 6, and 10 of the Community Transportation Alternative, as it relates to land use planning and traffic management, are not in the decision space of this planning process. Land use planning and traffic management are under the decision authority of the local jurisdictions and are outside the decision space for this EIS; therefore, this alternative has not been carried forward for detailed analysis in the EIS.
- Alternatives 3, 8, and 9 are suggested roadway and transit improvements that would not considerably improve east-west travel demand in the St. George urbanized area when compared to other alternatives analyzed in the EIS and would be substantially similar to the No Action Alternative. Therefore, these alternatives were not carried forward for detailed analysis in the EIS.

5. Transportation and Resource Considerations

A transportation analysis and resource assessment for the remaining eight Northern Corridor alternatives was performed to better compare the differences in effects between the alternatives and assess the alternatives' ability to meet the criteria for reasonableness. The eight Northern Corridor alternatives evaluated for the transportation analysis and the resource assessment include (Figure 2):

- Northern Alignment
- T-Bone Mesa Alignment

- UDOT Application Alignment
- Southern Alignment
- Red Hills Parkway Expressway
- Widen Red Hills Parkway
- St. George Boulevard/100 South One-way Couplet
- Widen St. George Boulevard

5.1 Transportation Analysis

The transportation analysis evaluated the alternatives' ability to meet the applicant's objective and transportation purpose and need of the project. The transportation analysis focused on several performance measures used to determine if an alternative met the transportation purpose and need and to compare how well each alternative performed based on these measures. Table 3 describes the performance measures used to compare the alternatives. The transportation analysis included evening peak hour intersection LOS at key intersections along the primary east-west roadways and travel time for routes along similar roadways for the different Northern Corridor alternatives.

Table 3. Transportation Performance Measures

Criterion	Performance Measure
LOS	LOS D is a minimum standard goal for urban areas; LOS C is desirable. LOS is reported as average minutes of delay per vehicle.
Travel Time	Travel time compared to the No Action Alternative. Travel time is reported as average minutes of travel per vehicle.

5.1.1 Transportation Results

Tables 4 and 5 contain the results of the transportation analysis for LOS and travel time, respectively. Travel times were measured between I-15 north of exit 13 and Sunset Boulevard just west of Bluff Street using seven separate routes (Figure 3).

To determine if an alternative met the applicant's objective and transportation purpose and need, each alternative's performance was compared to the No Action Alternative. The results of the LOS analysis and the travel time comparison indicate that the Northern Alignment does not improve conditions over the No Action Alternative, and therefore, does not meet the applicant's objective and transportation purpose and need. The alternatives that improved LOS and travel time comparatively better than the other alternatives evaluated were the T-Bone Mesa Alignment, UDOT Application Alignment, Red Hills Parkway Expressway, and the St. George Boulevard/100 South One-way Couplet Alternative.

Although the Southern Alignment, Widen Red Hills Parkway to Six Lanes Alternative, and Widen St. George Boulevard Alternative met the overall applicant's objective and transportation purpose and need, they performed similarly to each other and did not show stronger improvements to LOS or travel time when compared to the T-Bone Mesa Alignment, UDOT Application Alignment, Red Hills Parkway Expressway, and the St. George Boulevard/100 South One-way Couplet Alternative. Associated specifically with the One-way Couplet Alternative is the additional intersection of Bluff Street/100 South, which would also be affected by the one-way couplet. Analysis shows this intersection would operate at LOS C in 2050 (result not shown in Table 4). The One-way Couplet Alternative would have additional travel time impacts to other local streets within the downtown St. George area not reflected in Table 5. This is due to vehicles having to undertake more out-of-direction travel to access the one-way couplet system to get to their destinations.

Table 4. Transportation Analysis: 2050 Evening Peak Hour Intersection LOS Results

Alternative	No Action	Northern	T-Bone Mesa	UDOT Application	Southern	Red Hills Parkway Expressway	Widen Red Hills Parkway	St. George Boulevard/100 South One-way Couplet	Widen St. George Boulevard
Intersection	LOS	LOS	LOS	LOS	LOS	LOS	LOS	LOS	LOS
Red Hills Parkway/Bluff Street	C	C	C	C	C	C	C	C	C
Sunset/Bluff Street	F	F	F	E	F	E	E	E	E
St. George Boulevard/Bluff Street	F	F	D	D	F	C	E	B	D
St. George Boulevard/Main Street	C	C	C	C	C	C	C	C	C
St. George Boulevard/1000 East	D	D	C	D	D	C	E	B	D
I-15 Exit 8 Southbound Ramps	C	C	C	C	C	C	F	C	C
I-15 Exit 8 Northbound Ramps	B	B	C	C	C	C	C	B	D
St. George Boulevard/River Road	D	D	D	D	D	D	D	C	D
Red Hills Parkway/200 East	B	B	A	A	B	A	A	B	A
Red Hills Parkway/1000 East	F	F	B	B	F	C	F	C	F
I-15 Exit 10	C	C	C	C	C	C	C	B	C
Green Spring/Buena Vista	C	C	C	C	C	C	C	D	C
Green Spring/Telegraph Street	E	E	D	E	E	E	D	E	E
I-15 Exit 13 Southbound Ramps	B	B	C	B	B	B	B	B	B
I-15 Exit 13 Northbound Ramps	A	A	B	B	B	A	A	A	A

Source: Horrocks Engineers 2020a

Table 5. Transportation Analysis: 2050 Evening Peak Hour Travel Time Results

Alternative	No Action	Northern	T-Bone Mesa	UDOT Application	Southern	Red Hills Parkway Expressway	Widen Red Hills Parkway	St. George Boulevard/100 South One-way Couplet	Widen St. George Boulevard
Route	Minutes	Minutes	Minutes	Minutes	Minutes	Minutes	Minutes	Minutes	Minutes
Route A	24	24	15	16	21	14	24	14	14
Route B	25	25	15	15	22	15	21	17	20
Route C	40	40	15	16	33	16	16	18	31
Route D	Not applicable	Not applicable	Not applicable	Not applicable	17	Not applicable	Not applicable	Not applicable	Not applicable
Route E	Not applicable	Not applicable	Not applicable	15	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Route F	Not applicable	Not applicable	14	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Route G	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	12	Not applicable	Not applicable	Not applicable

Source: Horrocks Engineers 2020a

In addition to the LOS traffic analysis and the travel time analysis, a traffic volume shift analysis was prepared to demonstrate the relative shift in traffic off existing roadways to the Northern Corridor based on location. Figure 4 displays the shift of traffic off existing roadways onto the new Northern Corridor alignment as a percent reduction of traffic volumes. For each alignment, the overall volume of vehicles that are projected to use the alignment are represented as the raw number (i.e., 2K meaning 2,000).

The T-Bone Mesa Alignment and UDOT Application Alignment both attract a higher percentage of vehicles over the Southern Alignment and would alleviate congestion off existing roadways. This is because of the overall length of the alternatives as well as proximity and similar routing of the Southern Alignment to Red Hills Parkway.

5.2 Resource Impact Assessment

A preliminary resource assessment was performed to better compare the effects between alternatives. This was accomplished by quantifying, at a high level, impacts to select resources and comparing the impacts of one alternative to another. Specifically, potential impacts to the Mojave desert tortoise and impacts to property were considered. The impacts were assessed based on high-level conceptual engineering design. A 500-foot corridor was used for the alternatives within the NCA and a variable design width was assumed for the alternatives outside the NCA. Impacts were assessed by using readily available data and were estimated only for the purpose of providing a comparison between preliminary alternatives. Chapter 3 of the EIS describes the affected environment and environmental consequences for all resources and alternatives carried forward for detailed analysis in this planning process. Descriptions of impacts may differ in Chapter 3 of the EIS from what is presented here, as this analysis was completed with preliminary design assumptions that were further refined during the impact analysis carried out during development of the EIS.

Table 6 describes the resource criteria and measures used for the resource assessment.

Table 6. Resource Criteria Measures

Criterion	Measure
Mojave Desert Tortoise Impacts	Acres of suitable habitat impacted; fragmentation represented by acreage of contiguous fragment.
Property Impacts	Number of properties impacted, number of relocations, total acres impacted.

5.2.1 Resource Comparison Results

Tables 7 and 8 contain the results of the Mojave desert tortoise and property impact assessments, respectively.

Two criteria were used to assess Mojave desert tortoise impacts: suitable habitat and fragmentation. Suitable habitat was modeled using readily available data and is defined as areas where ecological conditions are adequate to support the species; this dataset includes occupied habitat. Fragmentation was reported in total acres of contiguous suitable habitat fragment assuming a break in a contiguous area was made by the alternative and the existing Cottonwood Road. The total acreage of suitable habitat was reported for the areas located northwest, northeast, southwest, southeast, and total for northwest and northeast and total for southwest and southeast for each alternative. Alternatives outside the Red Cliffs NCA were assumed not to produce any Mojave desert tortoise suitable habitat fragments.

In summary of the Mojave desert tortoise results, the T-Bone Mesa Alignment, UDOT Application Alignment, and the Southern Alignment would have similar effects to the Mojave desert tortoise. The

Southern Alignment results in slight differences with a larger contiguous northwest/northeast fragment, smaller southwest/southeast contiguous fragment but slightly more acres of suitable habitat impacted. The UDOT and T-Bone Mesa have similar effects in fragmentation and acreage of suitable habitat impacted. Alternatives outside of the NCA including Red Hills Parkway Expressway, Widen Red Hills Parkway, St. George/100 South One-way Couplet, and Widen St. George Boulevard are assumed to the have no impact to Mojave desert tortoise based on this comparative analysis.

Table 8 contains the results of the property impact assessment for each alternative. Impacts were assessed by overlaying the conceptual design for each alternative with readily available Washington County parcel data. Property impacts were measured in total number of non-residential and residential properties impacted, total number of business and residential relocations, and total acreage and type of property impacted. Relocations were determined by several factors: if the alternative came within 15 feet of a residential or business structure, it was determined to be a relocation; and if access to a residential or commercial property was removed with the alternative, then it was considered a relocation.

In summary, the alternatives outside of the NCA resulted in similar effects to properties with a few variations. The Widen St. George Boulevard Alternative had the most property impacts for both total properties impacted and relocations. Overall, the T-Bone Mesa Alignment, UDOT Application Alignment, and Southern Alignment had similar effects to properties with one variation: the Southern Alignment impacted slightly more acreage of property and resulted in one potential relocation.

Table 7. Mojave Desert Tortoise Impact Assessment Results for Preliminary Alternative Comparison [a]

Alternative	Acres of Suitable Habitat Impacted [b]	Acres of Contiguous Suitable Fragment Northwest	Acres of Contiguous Suitable Fragment Northeast	Acres of Contiguous Suitable Fragment Southwest	Acres of Contiguous Suitable Fragment Southeast	Acres of Contiguous Suitable Fragment Total Northwest/Northeast Total Southwest/Southeast
T-Bone Mesa Alignment	248	8,793	27,380	1,072	1,363	36,173 2,435
UDOT Application Alignment	263	9,151	28,106	716	620	37,257 1,336
Southern Alignment	346	9,650	28,510	Multiple fragments ranging from 19 to 133 acres	Multiple fragments ranging from 19 to 133 acres	38,160 349
Red Hills Parkway Expressway	0	0	0	0	0	0
Widen Red Hills Parkway	7	0	0	0	0	0
St George Boulevard/100 South One-way Couplet	0	0	0	0	0	0
Widen St. George Boulevard	0	0	0	0	0	0

[a] The impacts summarized in this table reflect calculations used during the preliminary resource assessment to compare alternatives; they do not reflect the detailed impact analysis conducted for and documented within the EIS.

[b] Suitable habitat, modeled by the U.S. Geological Survey, is defined as areas where ecological conditions are adequate to support the species. This dataset includes occupied habitat.

Table 8. Property Impact Assessment Results for Preliminary Alternative Comparison [a]

Alternative	Property Impacts – Non-residential [b]	Property Impacts – Residential [c]	Number of Relocations – Business [d]	Number of Relocations – Residential [e]	Acres Impacted – Non-Residential [f]	Acres Impacted – Residential [g]
No Action	0	0	0	0	0	0
T-Bone Mesa Alignment	0	0	0	0	249 (Vacant)	0
UDOT Application Alignment	0	0	0	0	266 (Vacant)	0
Southern Alignment	0	6	0	1 (Relocation) 5 (Potential)	6.2 (Commercial) 338 (Vacant) 9.3 (Other)	3.5
Red Hills Parkway Expressway	34 (Commercial) 3 (Vacant) 23 (Other)	0	31 (Relocation) 29 (Potential)	0	37 (Commercial) 68 (Vacant) 26 (Other)	0
Widen Red Hills Parkway	20 (Commercial) 2 (Null)	6	18 (Relocation) 4 (Potential)	5 (Relocation) 1 (Potential)	30 (Commercial) 7 (Vacant) 8 (Null)	0.8
St. George Boulevard/100 South One-way Couplet	11 (Commercial)	0	11 (Potential)	0	0.2 (Commercial) 0.1 (Null)	0
Widen St. George Boulevard	68 (Commercial)	1	38 (Relocation) 30 (Potential)	1 (Relocation)	4 (Commercial) 0.1 (Null)	0.3

[a] The impacts summarized in this table reflect calculations used during the preliminary resource assessment to compare alternatives; they do not reflect the detailed impact analysis conducted for and documented within the EIS.

[b] Total number of businesses potentially impacted by the proposed alternative; non-residential properties include commercial, vacant, or exempt.

[c] Total number of homes potentially impacted by the proposed alternative.

[d] Total businesses that would be relocated as a result of the proposed alternative.

[e] Total households that would be relocated as a result of the proposed alternative.

[f] Total acres of non-residential parcels that would experience some level of impact from the proposed alternative; non-residential properties include commercial, vacant, or exempt.

[g] Total acres of residential parcels that would experience some level of impact from the proposed alternative.

5.2.2 Alternatives Considered but Not Analyzed in Detail

Based on the outcome of the transportation analysis and resource assessment, several additional alternatives were not carried forward for detailed analysis in the EIS.

The Northern Alignment (Cottonwood Wilderness) would result in the same traffic conditions as the No Action Alternative, showing no improvement to future congestion or east-west connectivity in the St. George urbanized area. The implementation of this alternative is remote or speculative due to the increased length of the potential roadway and the associated increased cost, which may make it economically infeasible to construct because it does not result in reduced congestion. Therefore, the Northern Alignment is not considered a reasonable alternative to the proposed action and was not carried forward for detailed analysis.

The Widen Red Hills Parkway Alternative would have substantially similar effects to many resources as the Red Hills Parkway Expressway Alternative carried forward in the EIS, but would result in comparatively greater effects to some resources such as socioeconomics due to the potential need to expand on to adjoining properties. In addition, its implementation is remote or speculative and it may not be economically feasible due to the amount of private property that may need to be acquired to accommodate the larger footprint. Therefore, this alternative was not carried forward for detailed analysis in the EIS.

The Widen St. George Boulevard Alternative would have substantially similar effects to many resources as the St. George Boulevard/100 South One-way Couplet Alternative carried forward in the EIS, but would result in comparatively greater effects to some resources such as socioeconomics due to the need to expand onto more adjoining properties. In addition, its implementation is remote or speculative since it completely falls outside the jurisdiction of the Federal agencies and it may not be economically feasible due to the amount of private property that may need to be acquired to accommodate the larger footprint. Therefore, the Widen St. George Boulevard Alternative was eliminated from detailed analysis in the EIS.

6. Alternatives Considered in Detail in the EIS

The following Northern Corridor alternatives are being carried forward for detailed analysis in the Northern Corridor EIS (Figure 5):

- No Action Alternative
- T-Bone Mesa Alignment
- UDOT Application Alignment
- Southern Alignment
- Red Hills Parkway Expressway
- St. George Boulevard/100 South One-way Couplet

The Northern Corridor alternatives carried forward would have independent utility because they would be usable and be a reasonable expenditure of public funds, even if no additional transportation improvements in the area are made.

The No Action Alternative is required by NEPA and serves as a baseline against which to compare the environmental consequences that could be associated with implementation of other alternatives. The alternatives are described in Section 4 of this report and displayed on Figure 5. Figure 6 displays the proposed typical section for the T-Bone Mesa Alignment, UDOT Application Alignment, and Southern Alignment, and Figures 7 through 9 contain a more detailed plan view for these alignments, which share the same design details. Figures 10 and 11 display the plan view for the Red Hills Parkway Expressway

Alternative and the St. George Boulevard/100 South One-way Couplet Alternative, respectively. The exact widths and footprints have not been determined based on the high-level, conceptual design performed as part of the EIS. However, sufficient design has been done to estimate the impact footprint for each alternative and to satisfy the level of detailed analysis required for the EIS.

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Attachment 1. Figures

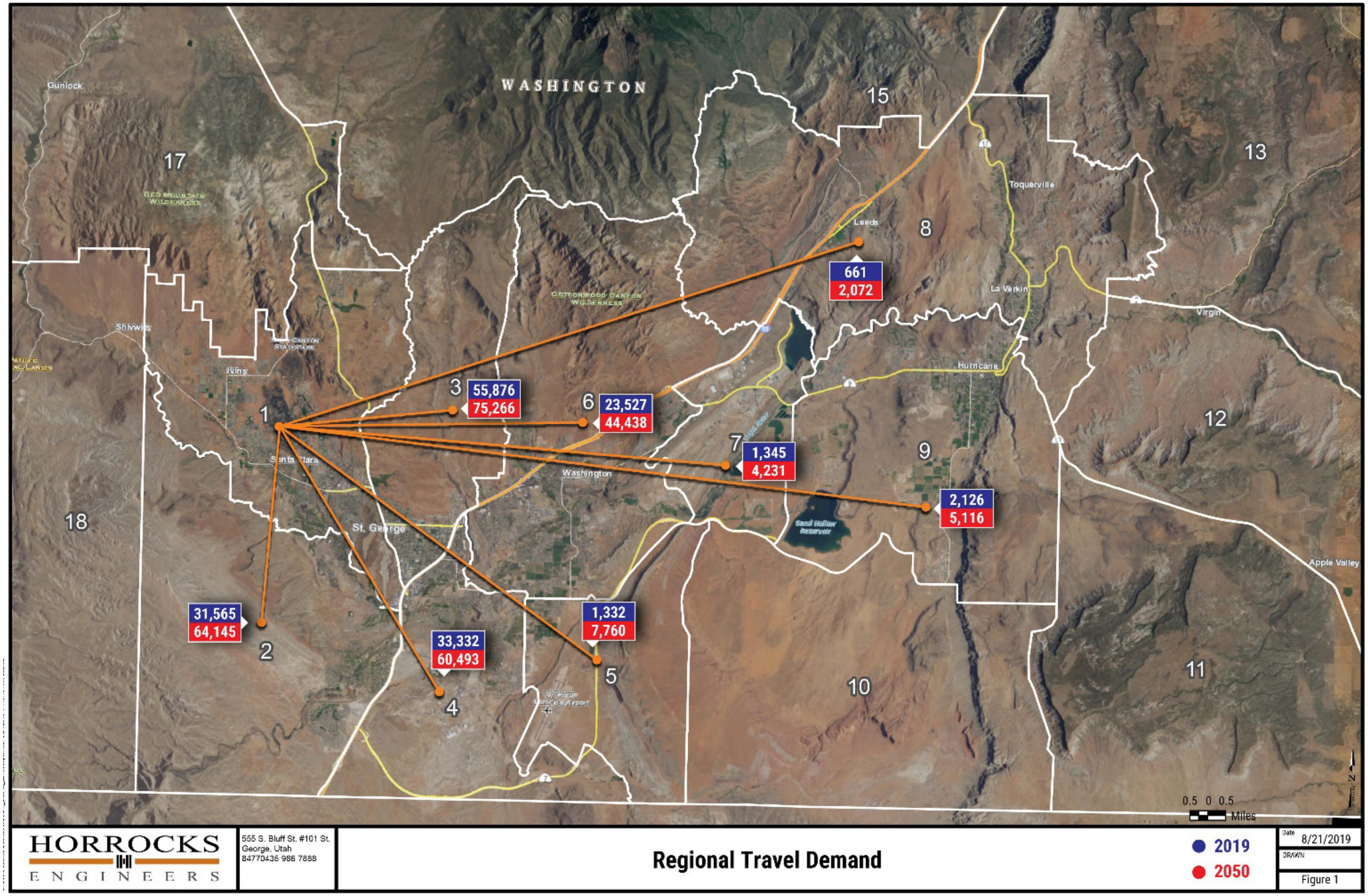


Figure 1. Regional Travel Demand

Source: Horrocks Engineers 2020a.

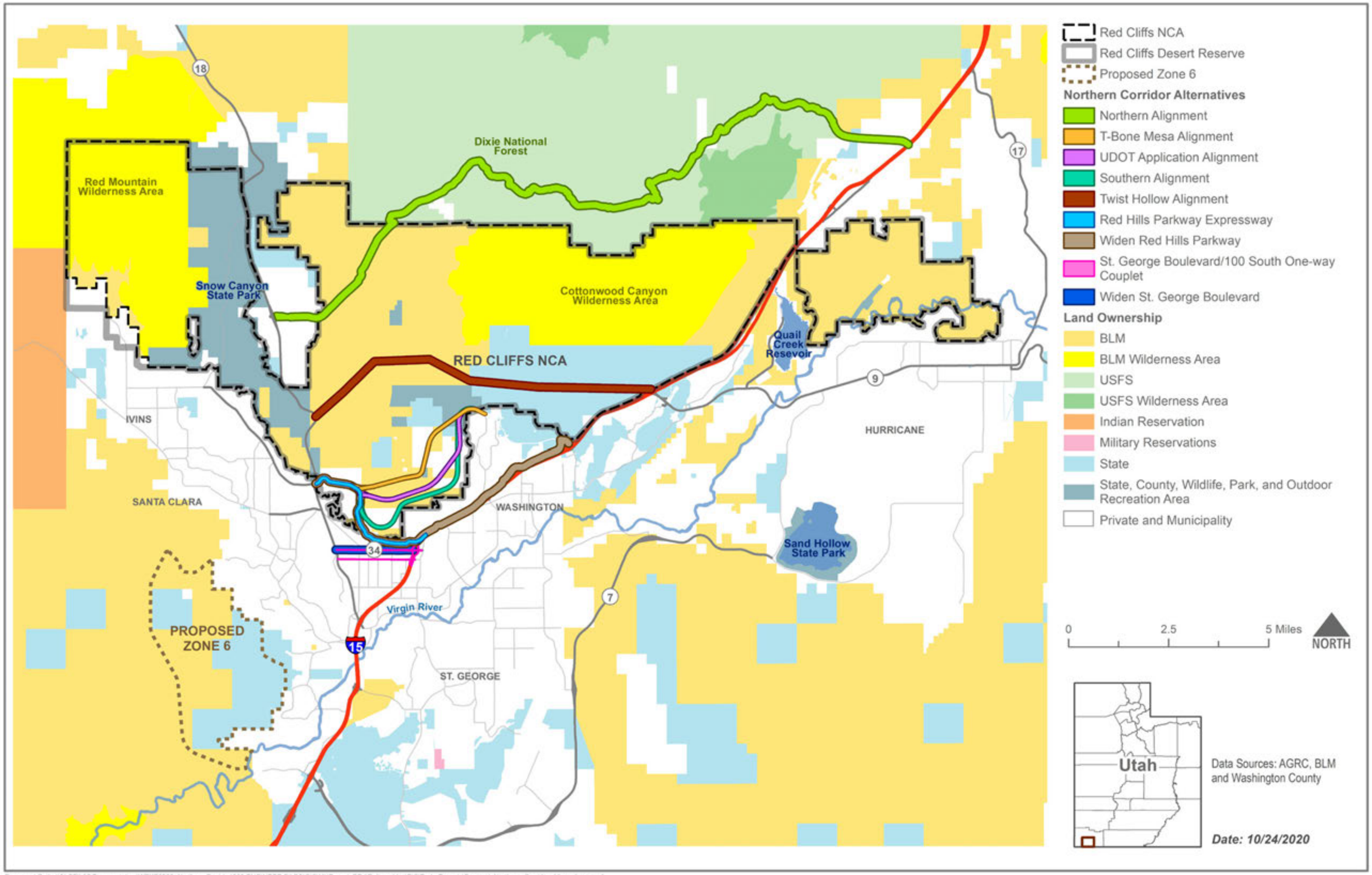


Figure 2. Alternatives Considered for Transportation and Resource Effects Analysis

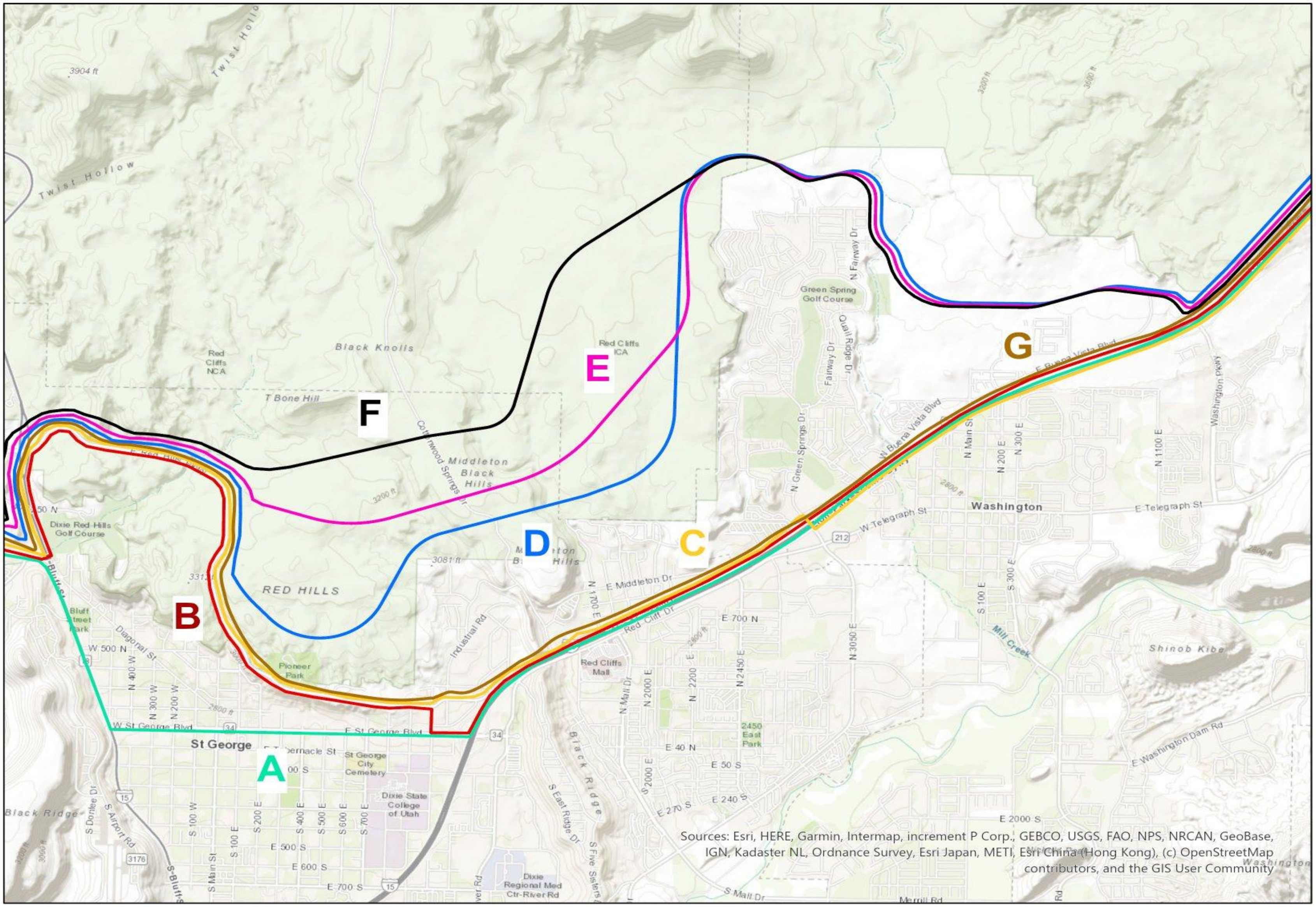
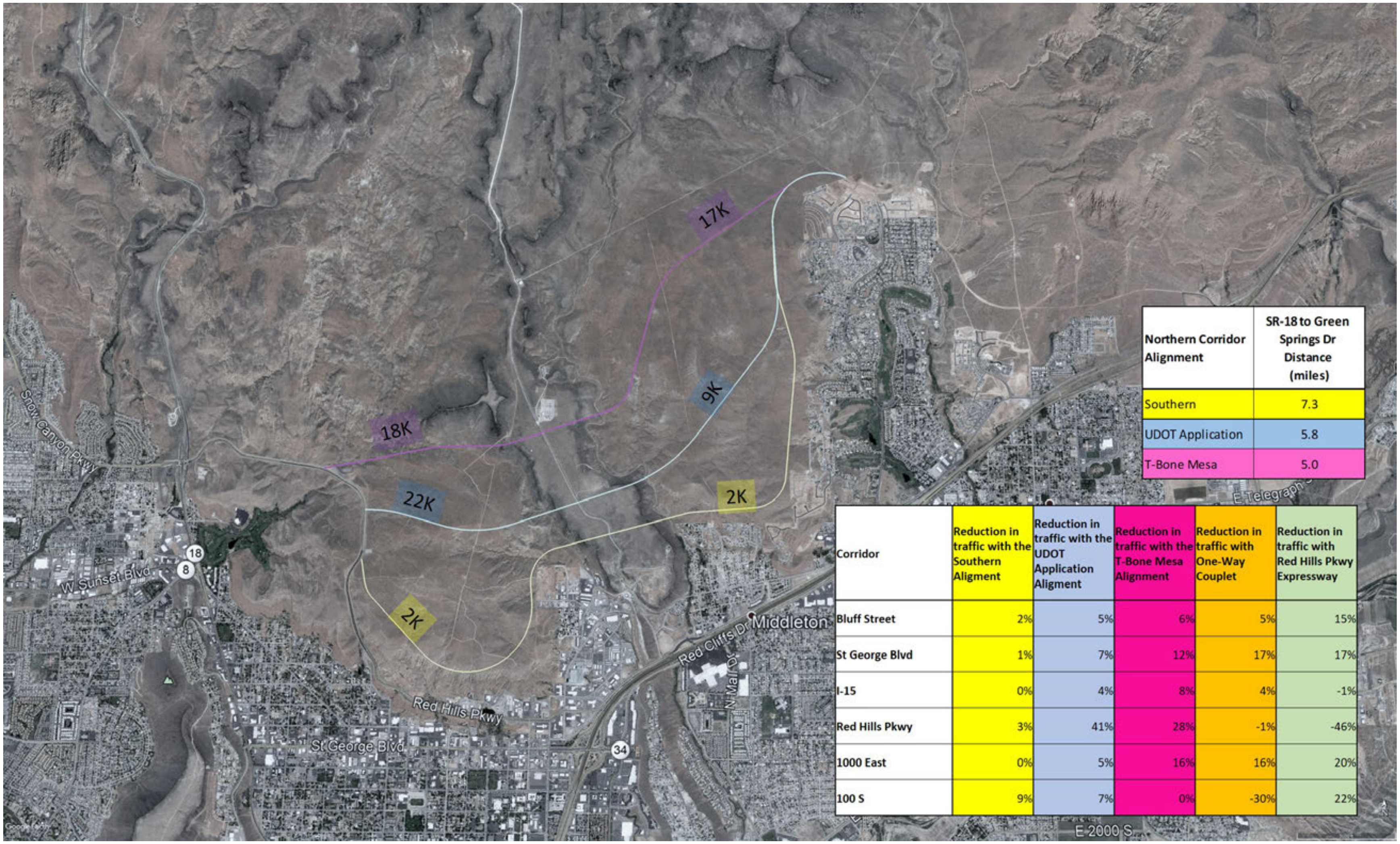


Figure 3. Routes Used for Travel Time Comparison

Source: Horrocks Engineers. 2020a.



Northern Corridor Alignment	SR-18 to Green Springs Dr Distance (miles)
Southern	7.3
UDOT Application	5.8
T-Bone Mesa	5.0

Corridor	Reduction in traffic with the Southern Aligment	Reduction in traffic with the UDOT Application Aligment	Reduction in traffic with the T-Bone Mesa Alignment	Reduction in traffic with One-Way Couplet	Reduction in traffic with Red Hills Pkwy Expressway
Bluff Street	2%	5%	6%	5%	15%
St George Blvd	1%	7%	12%	17%	17%
I-15	0%	4%	8%	4%	-1%
Red Hills Pkwy	3%	41%	28%	-1%	-46%
1000 East	0%	5%	16%	16%	20%
100 S	9%	7%	0%	-30%	22%

Figure 4. Daily Volume Comparison (Alternatives within the NCA)

Source: Horrocks Engineers. 2020a.

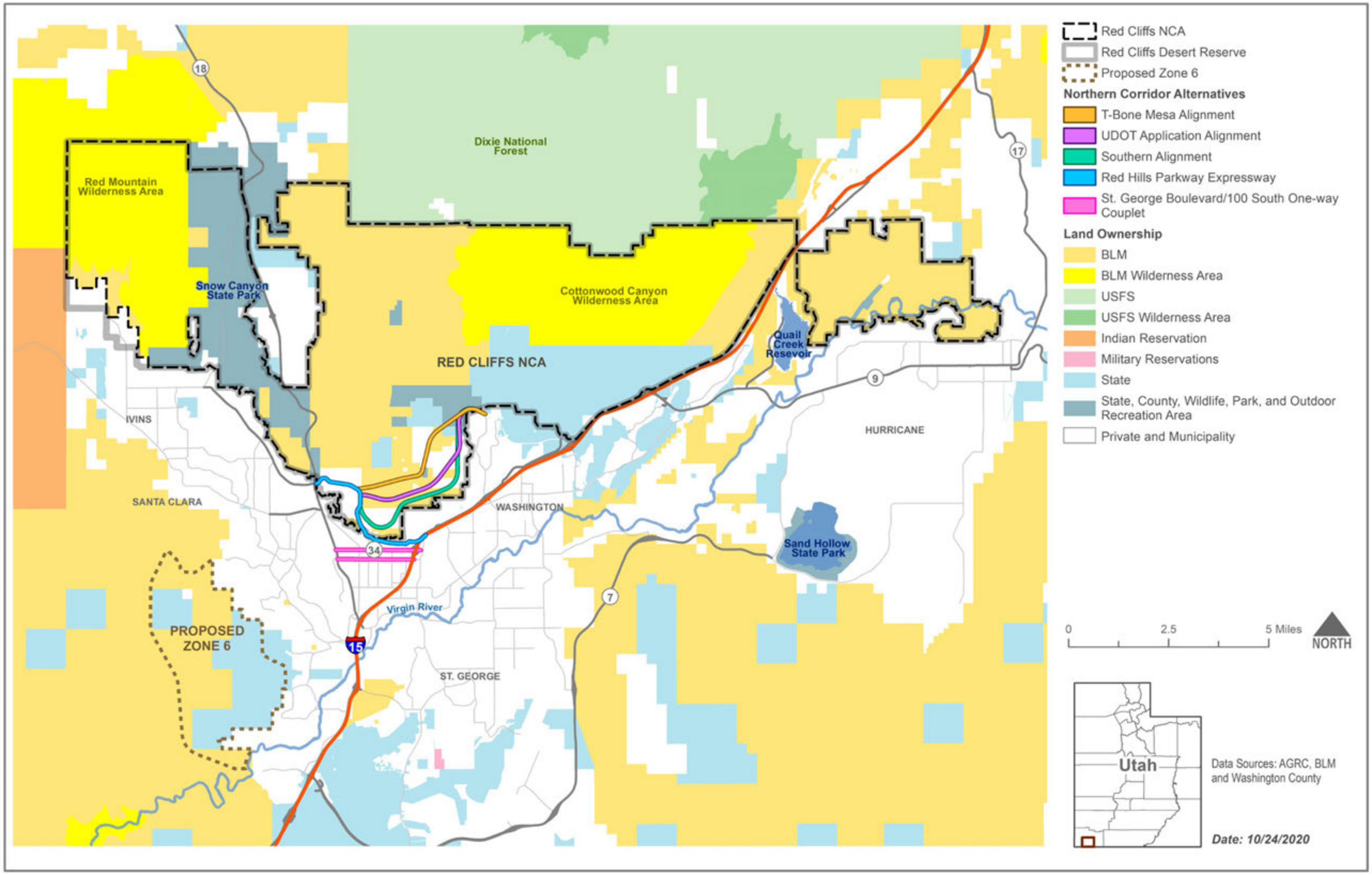
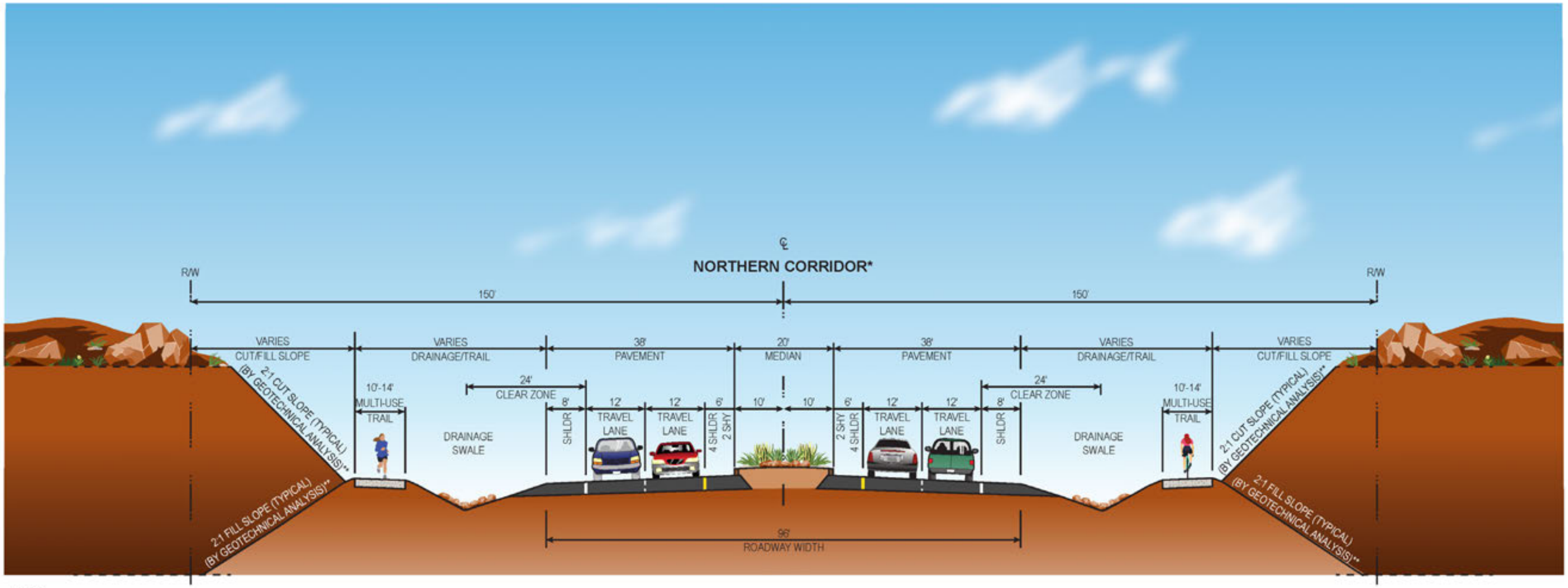


Figure 5. Alternatives Carried Forward for Detailed Analysis in EIS



NOTES:
*TOTAL ROW 300' – 500' DEPENDING ON SLOPE AND CONSTRUCTION REQUIREMENTS.
**THE FINAL SLOPE WILL BE BASED ON GEOTECHNICAL ANALYSIS, TERRAIN TYPE (E.G., ROCK OR DIRT), AND FURTHER DESIGN TO ACHIEVE A "BEST FIT" DESIGN THAT MINIMIZES IMPACTS AND BLENDS IN WITH THE NATURAL ENVIRONMENT.

Figure 6. T-Bone Mesa Alignment, UDOT Application Alignment, and Southern Alignment – Highway Cross Section, Eastbound within the NCA

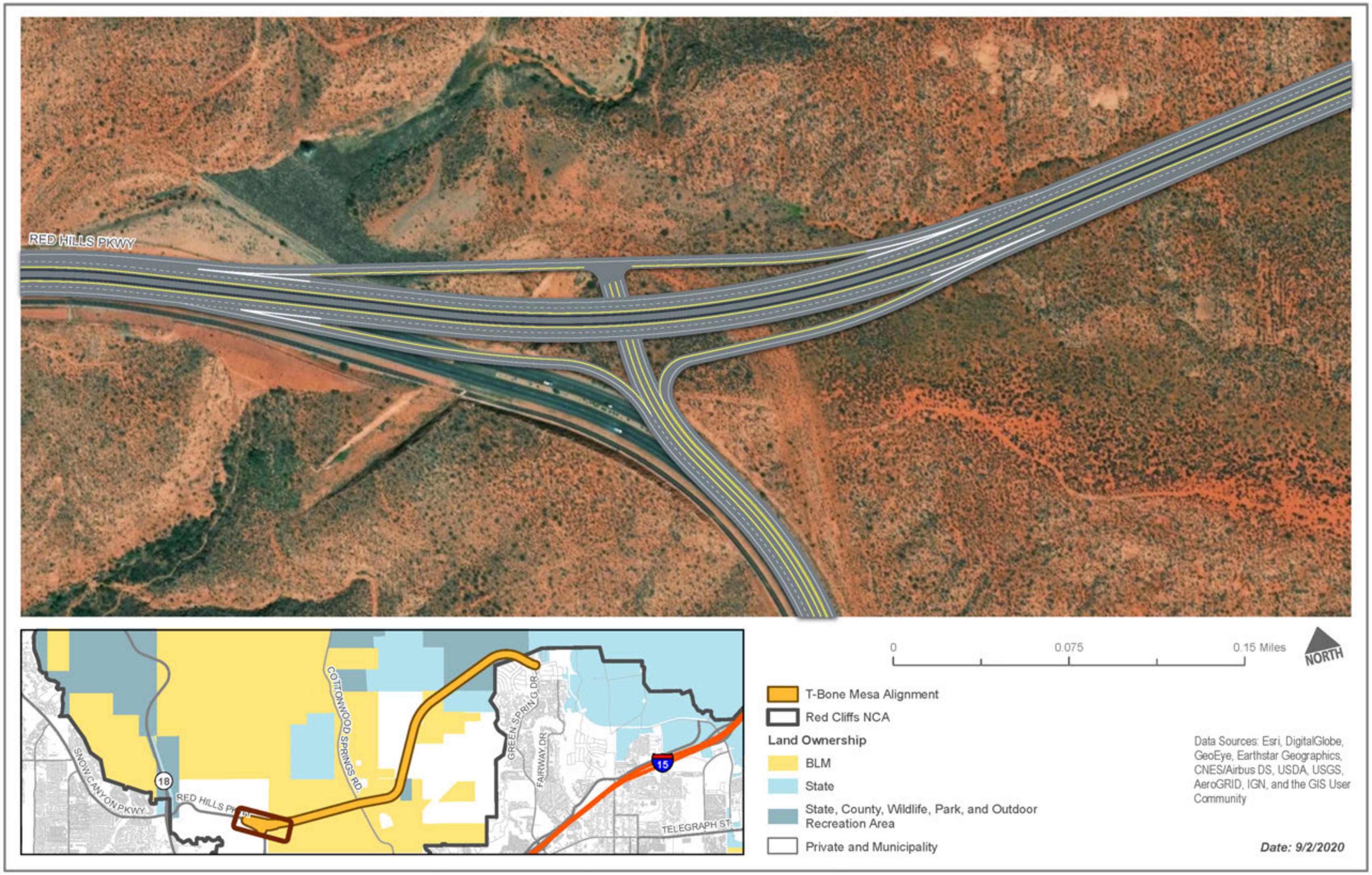


Figure 7a. T-Bone Mesa Alignment Plan View (1 of 8)

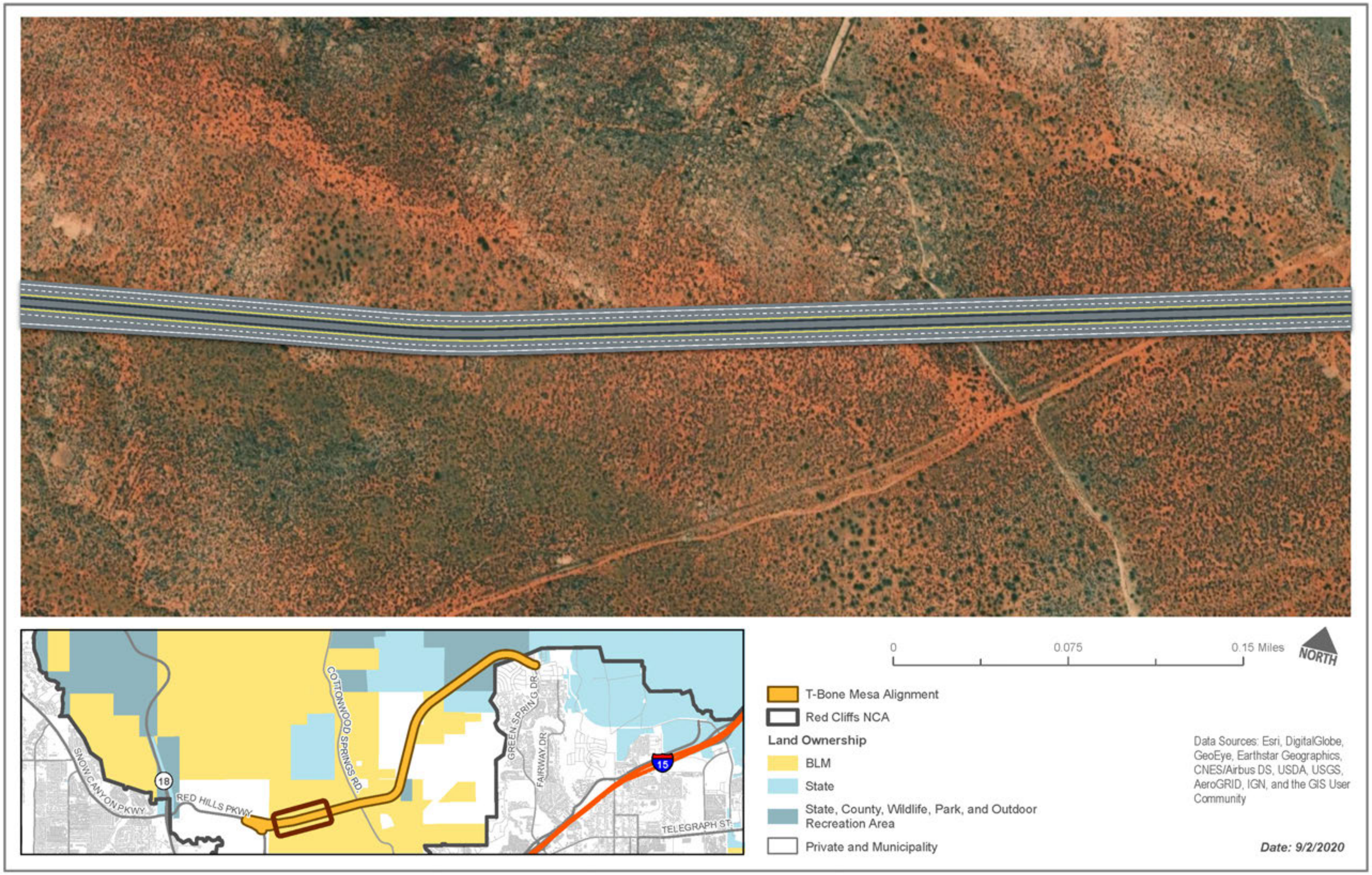


Figure 7b. T-Bone Mesa Alignment Plan View (2 of 8)

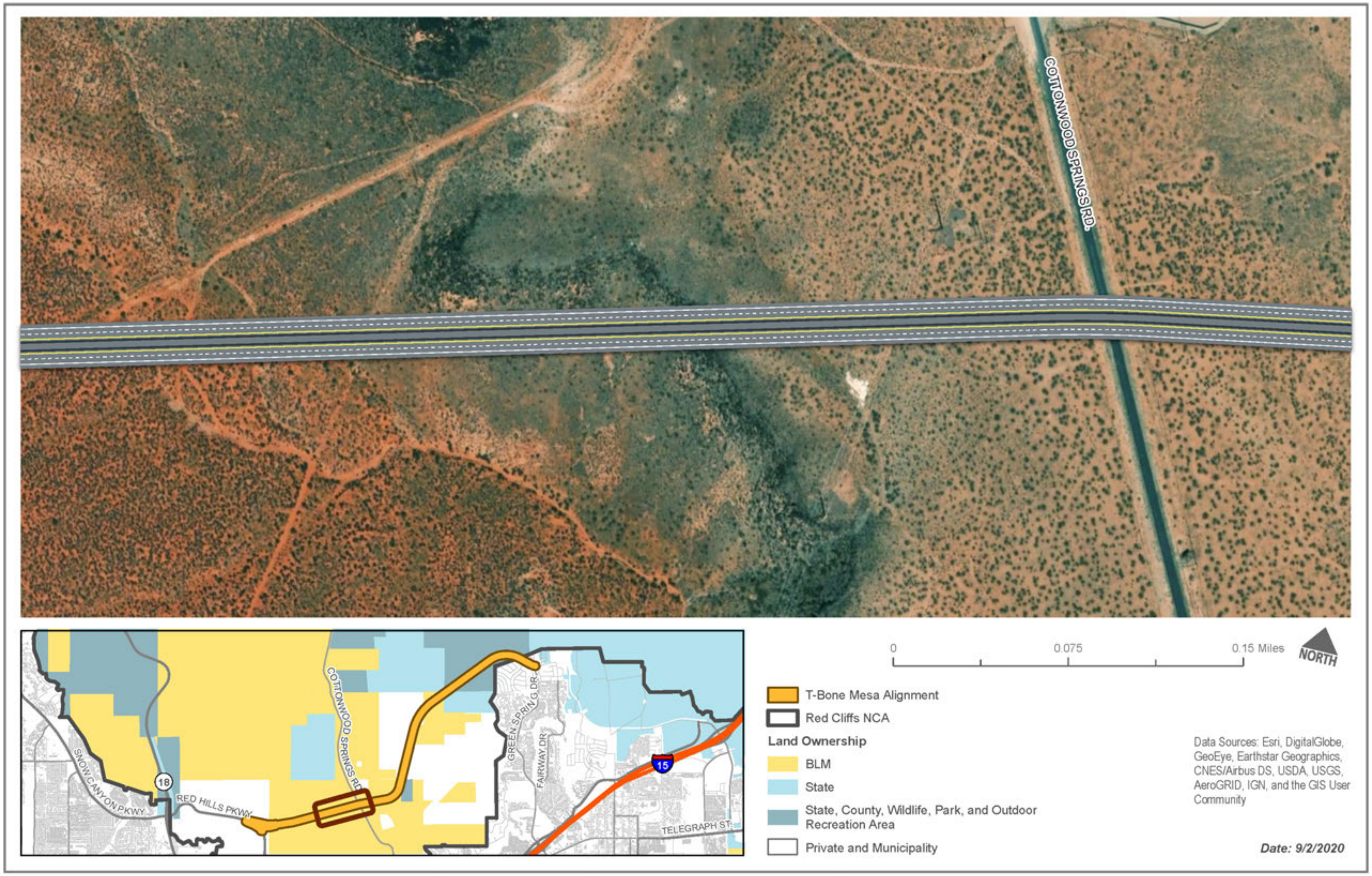


Figure 7c. **T-Bone Mesa Alignment Plan View (3 of 8)**

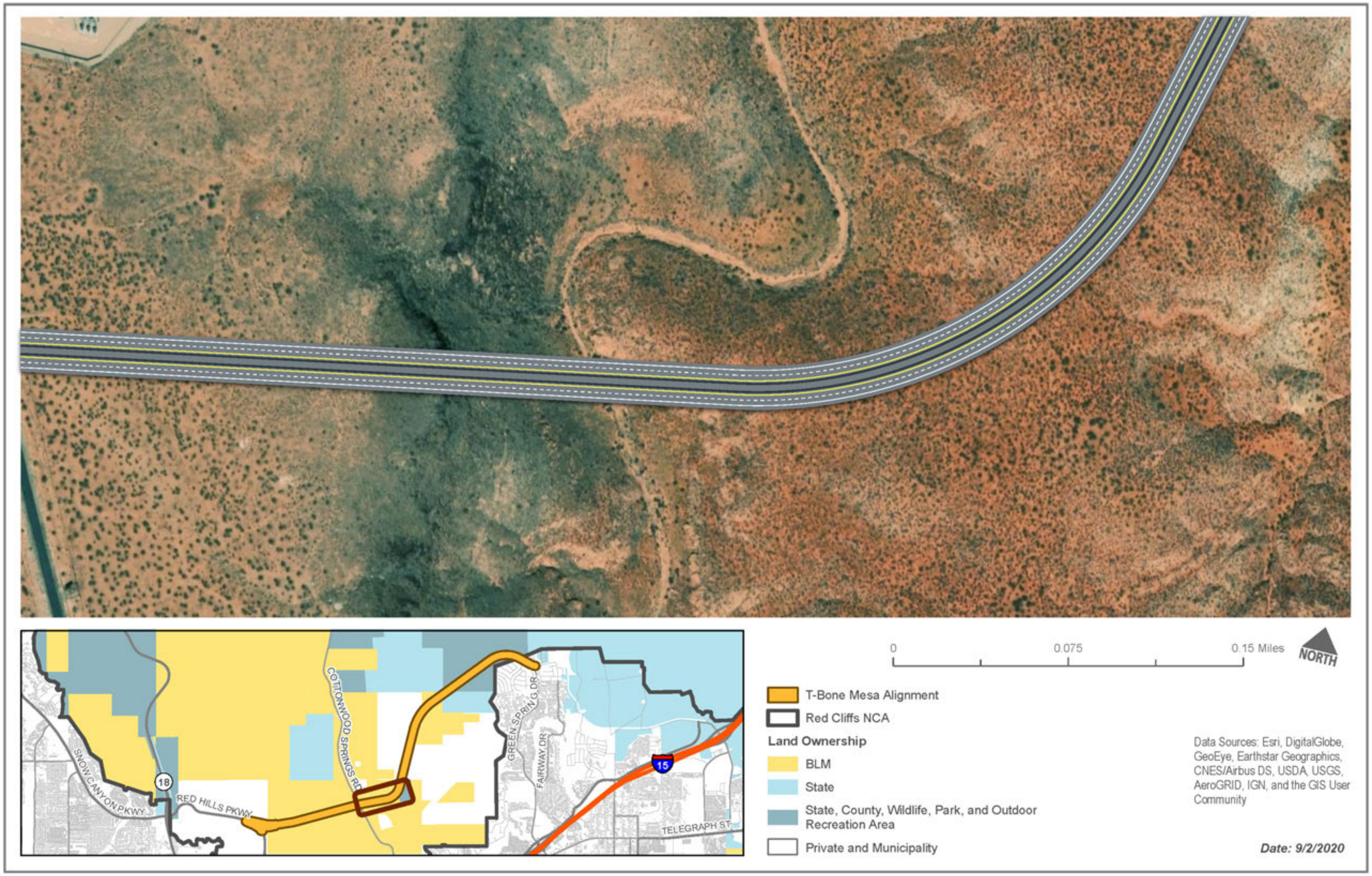


Figure 7d. T-Bone Mesa Alignment Plan View (4 of 8)

Figure 7e. **T-Bone Mesa Alignment Plan View (5 of 8)**

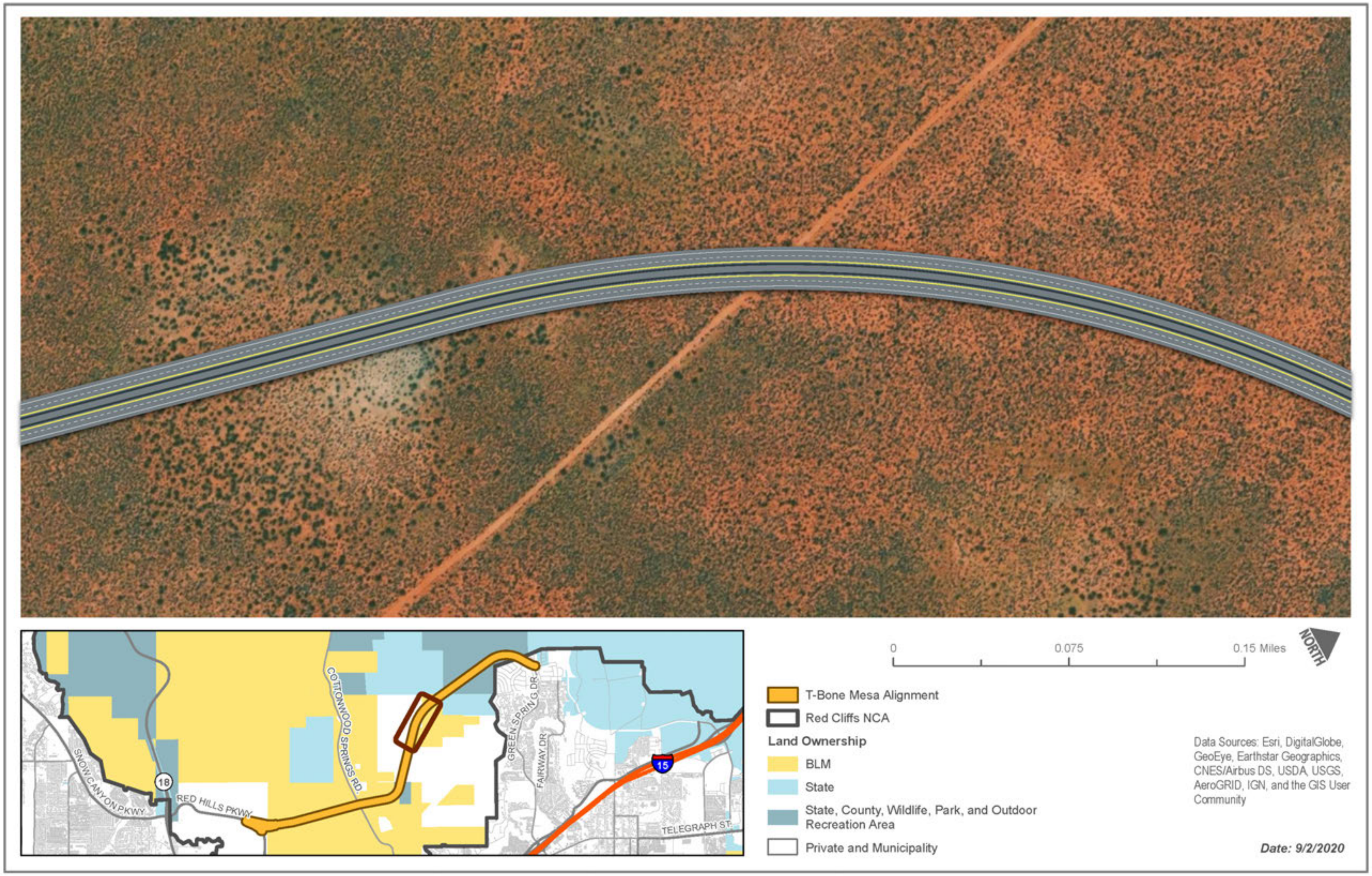


Figure 7f. T-Bone Mesa Alignment Plan View (6 of 8)

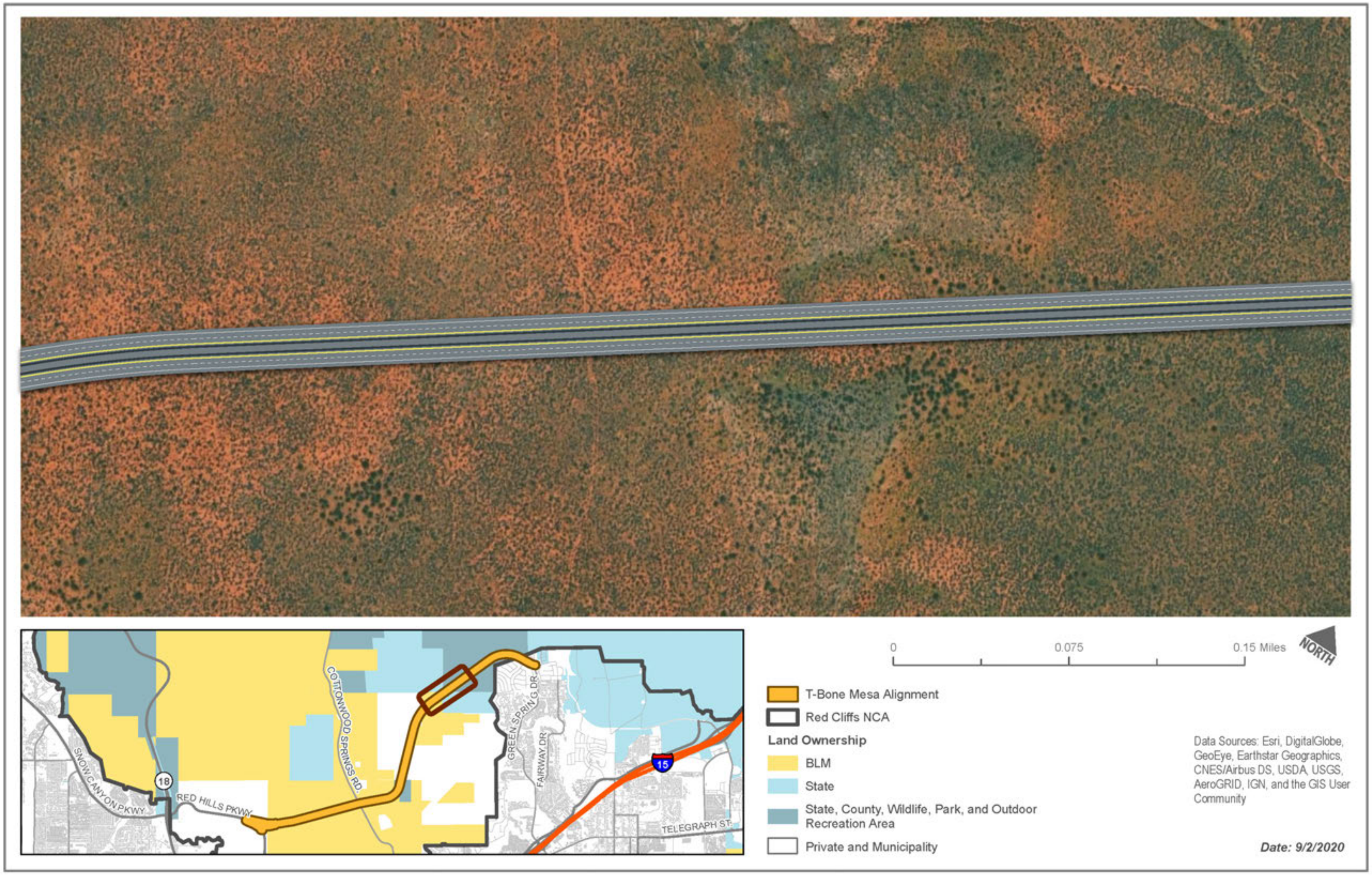


Figure 7g. T-Bone Mesa Alignment Plan View (7 of 8)

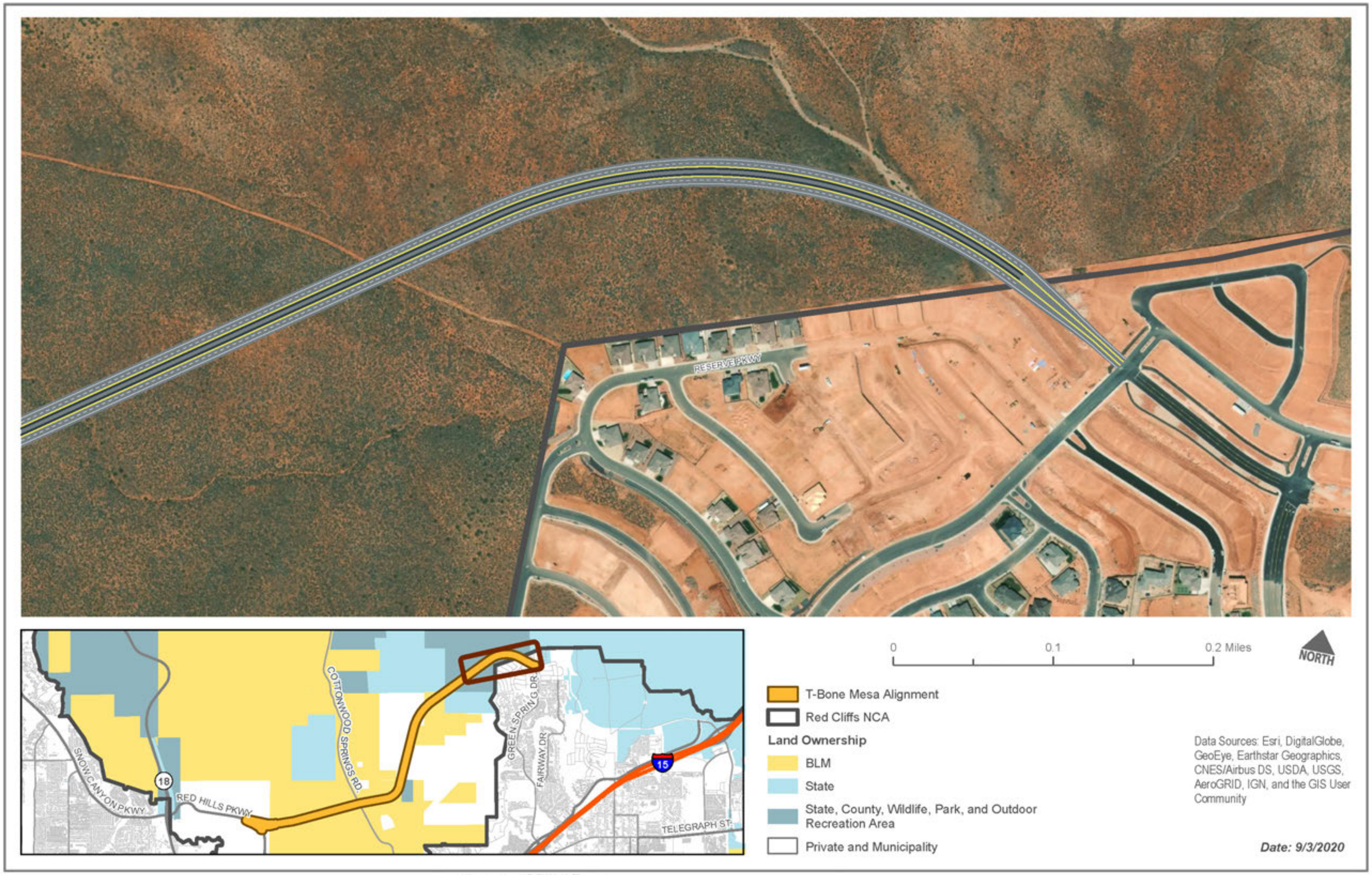


Figure 7h. T-Bone Mesa Alignment Plan View (8 of 8)

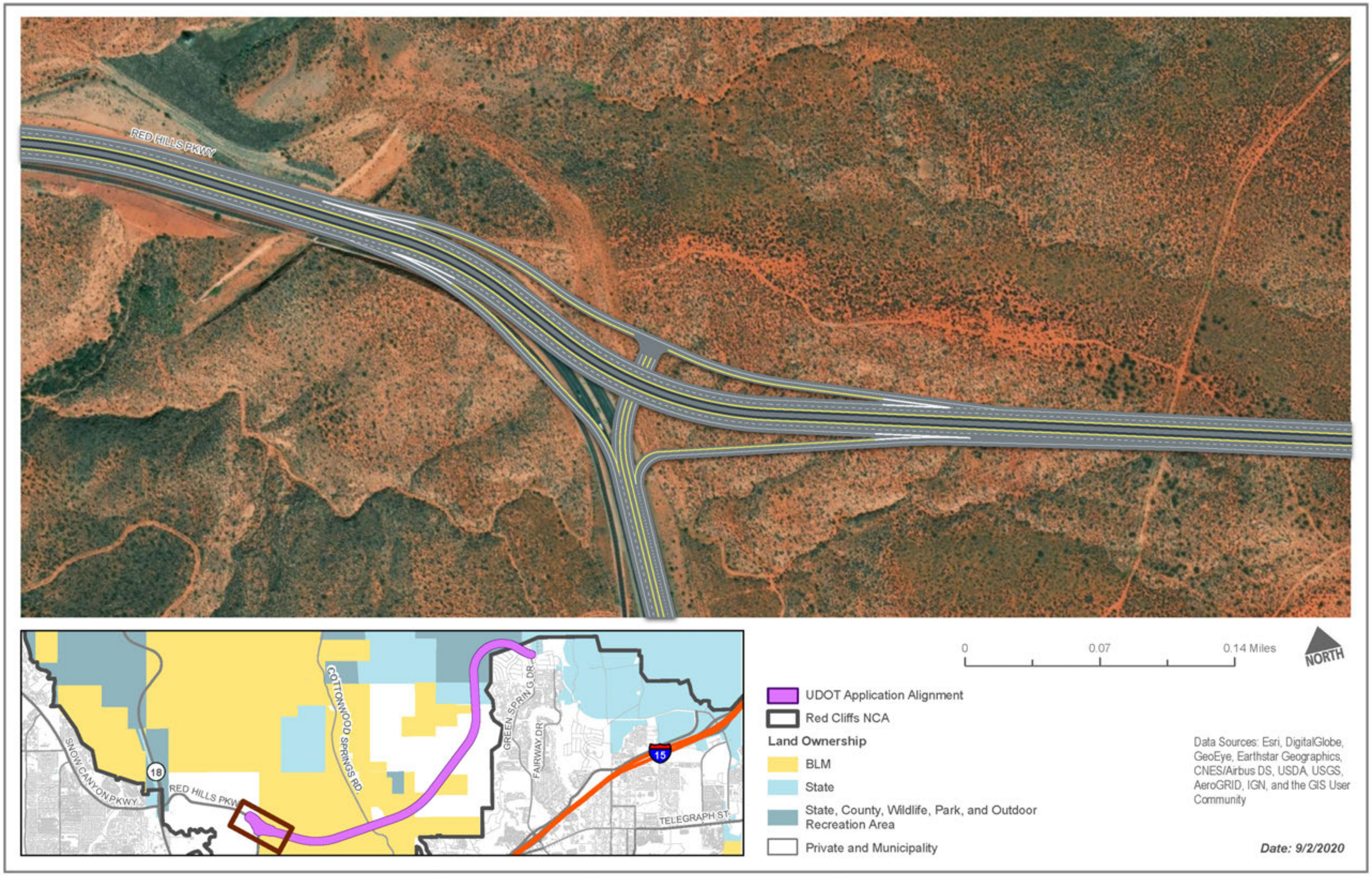


Figure 8a. UDOT Application Alignment Plan View (1 of 9)

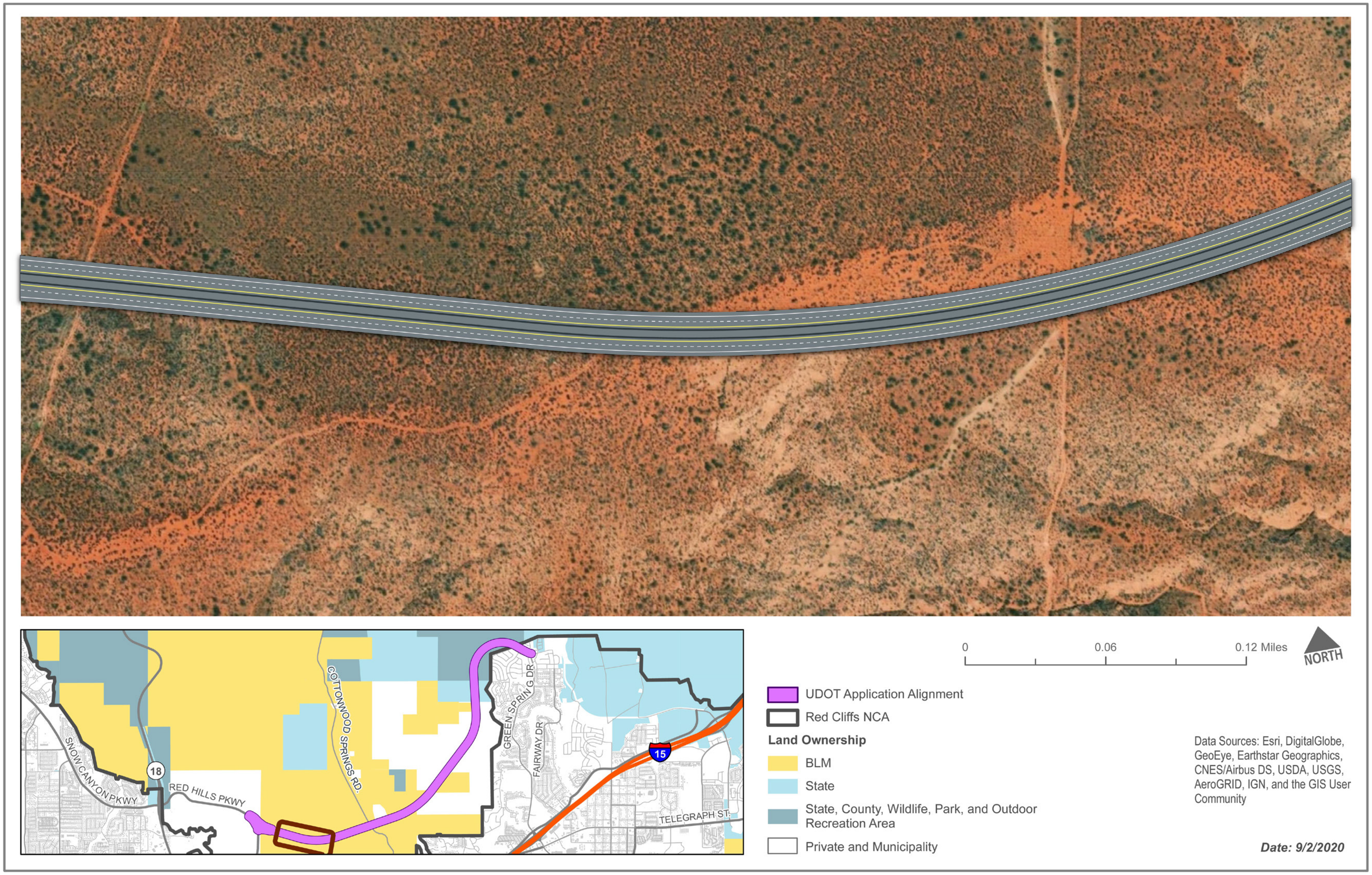


Figure 8b. UDOT Application Alignment Plan View (2 of 9)

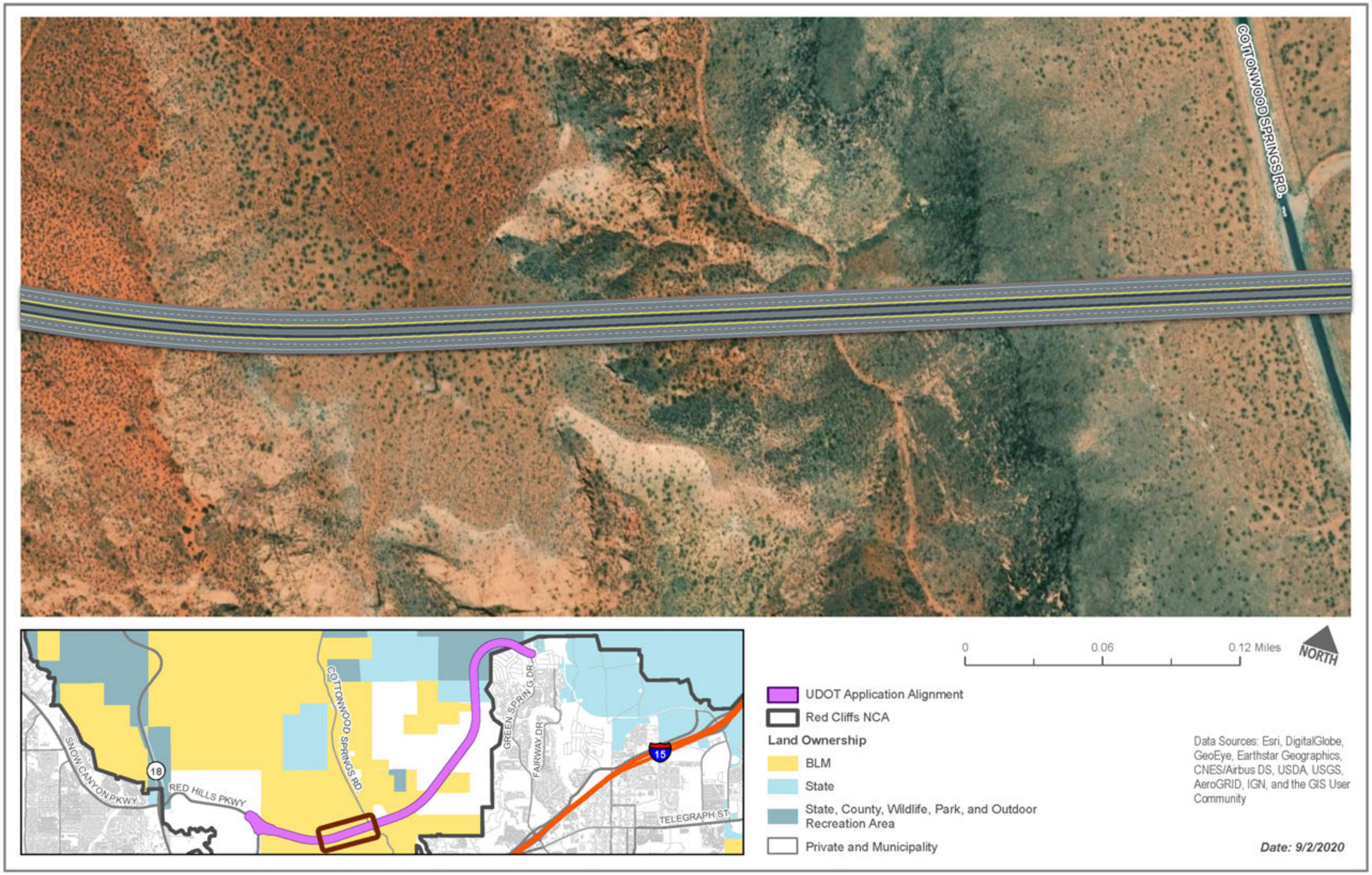


Figure 8c. UDOT Application Alignment Plan View (3 of 9)

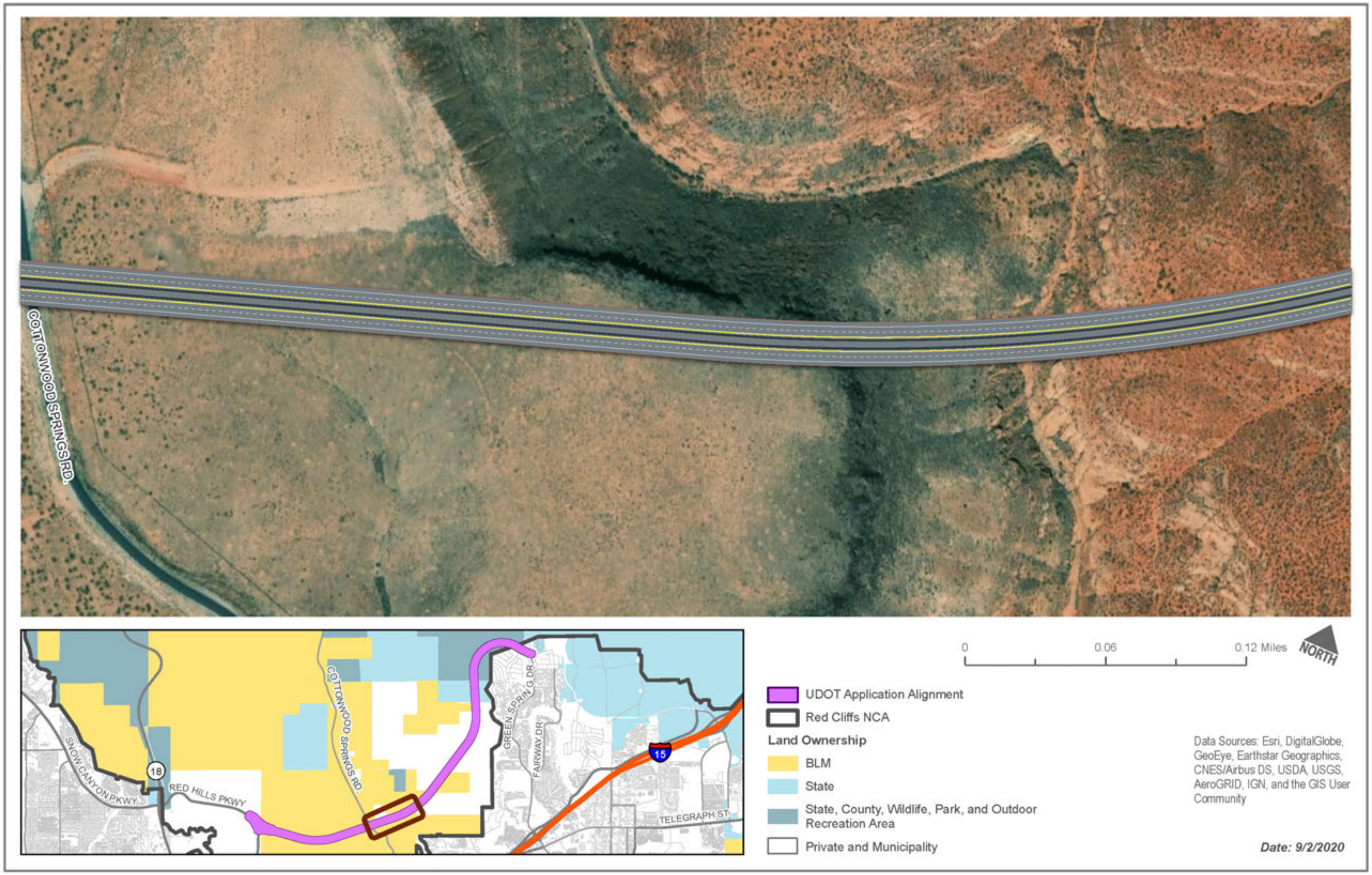


Figure 8d. UDOT Application Alignment Plan View (4 of 9)

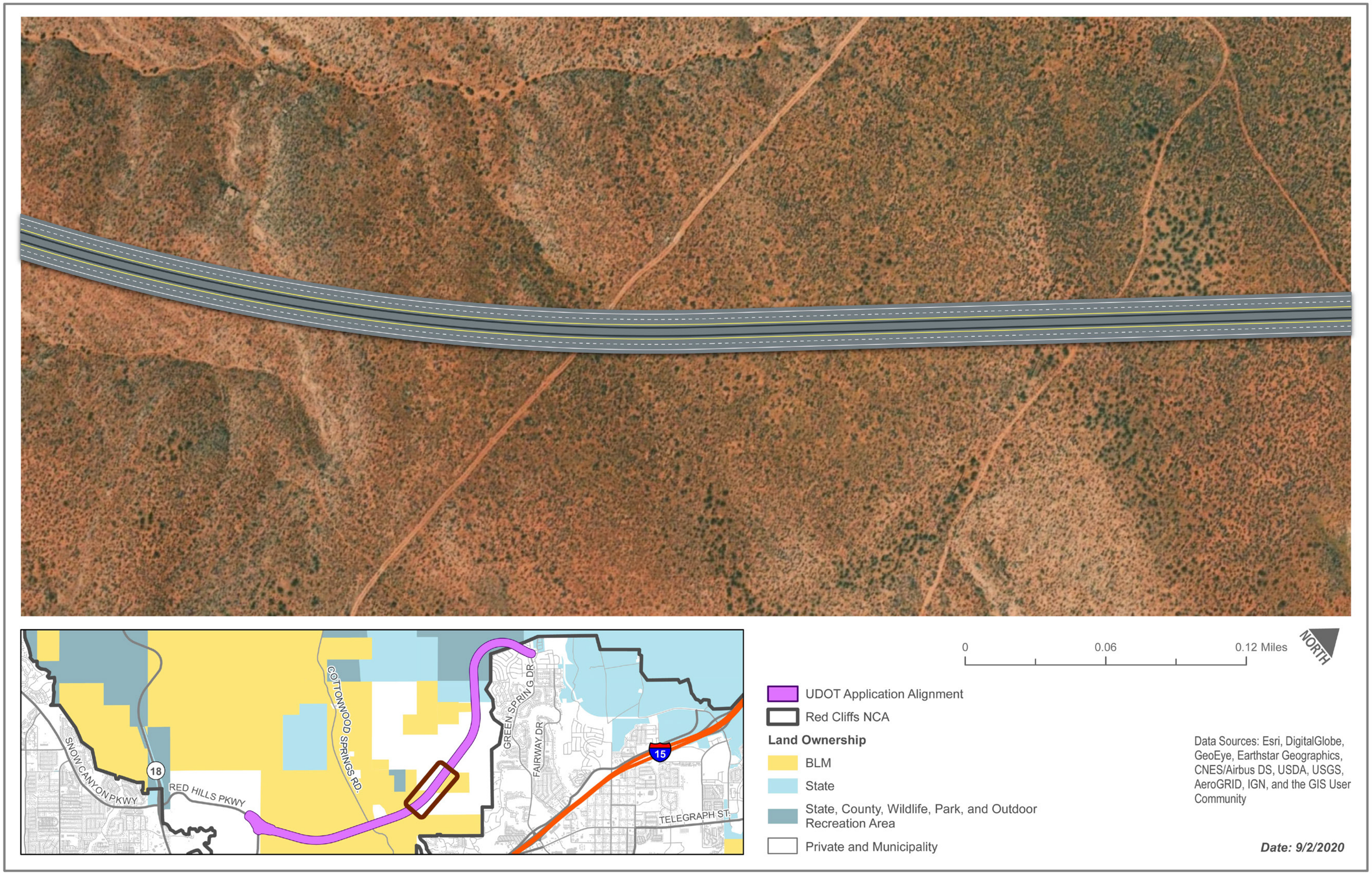


Figure 8e. UDOT Application Alignment Plan View (5 of 9)

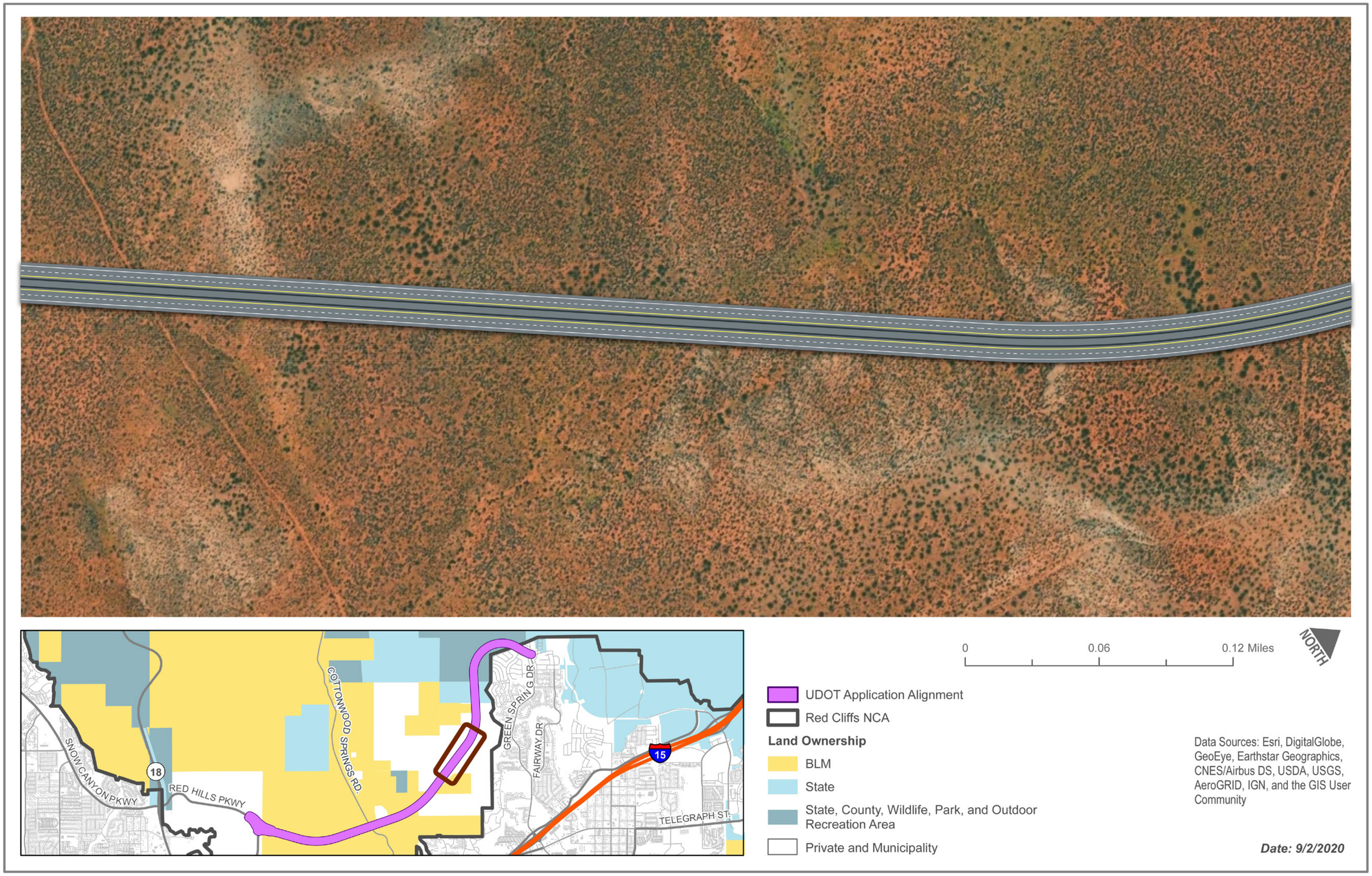


Figure 8f. UDOT Application Alignment Plan View (6 of 9)

Figure 8g. UDOT Application Alignment Plan View (7 of 9)

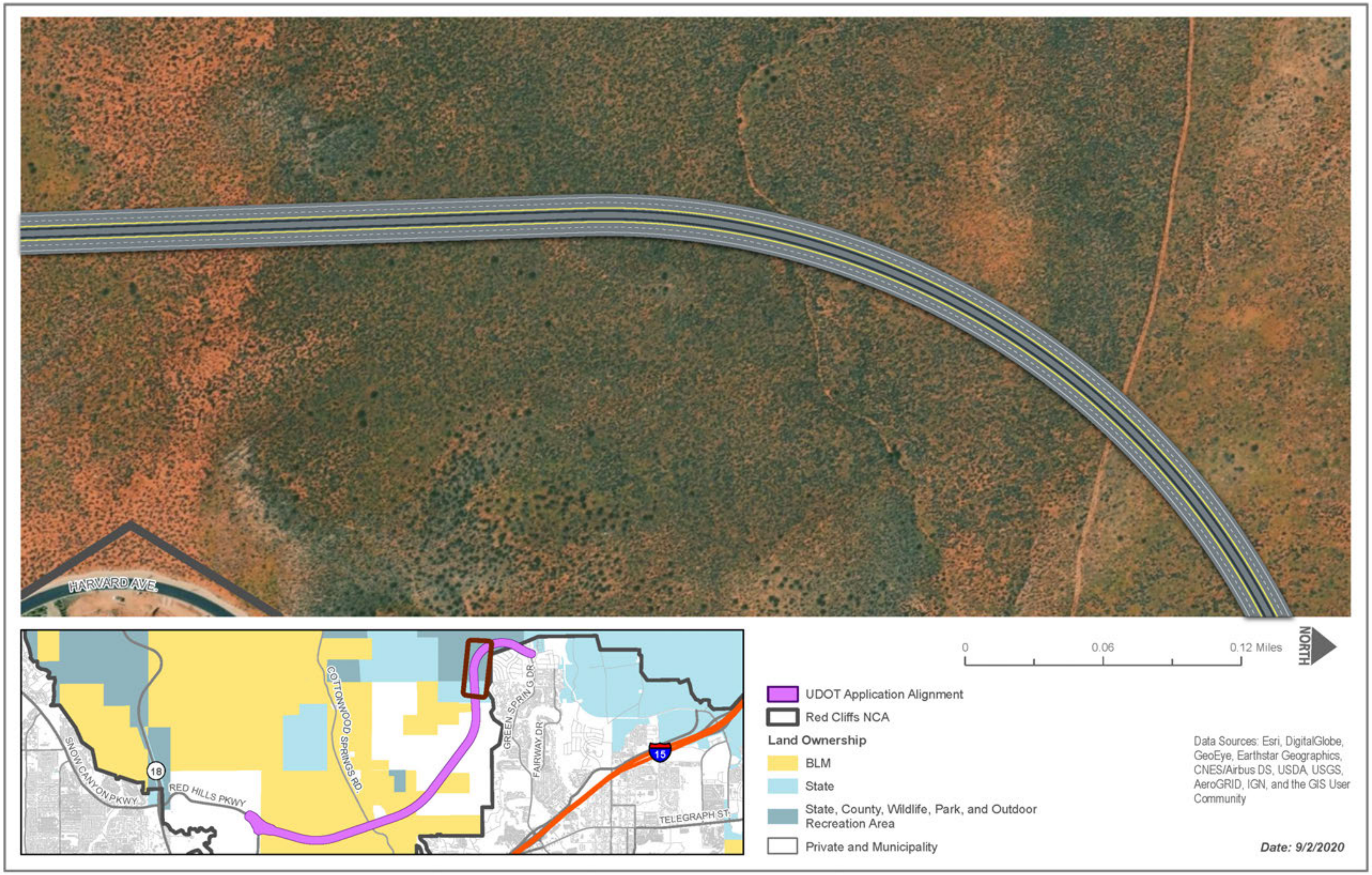


Figure 8h. UDOT Application Alignment Plan View (8 of 9)

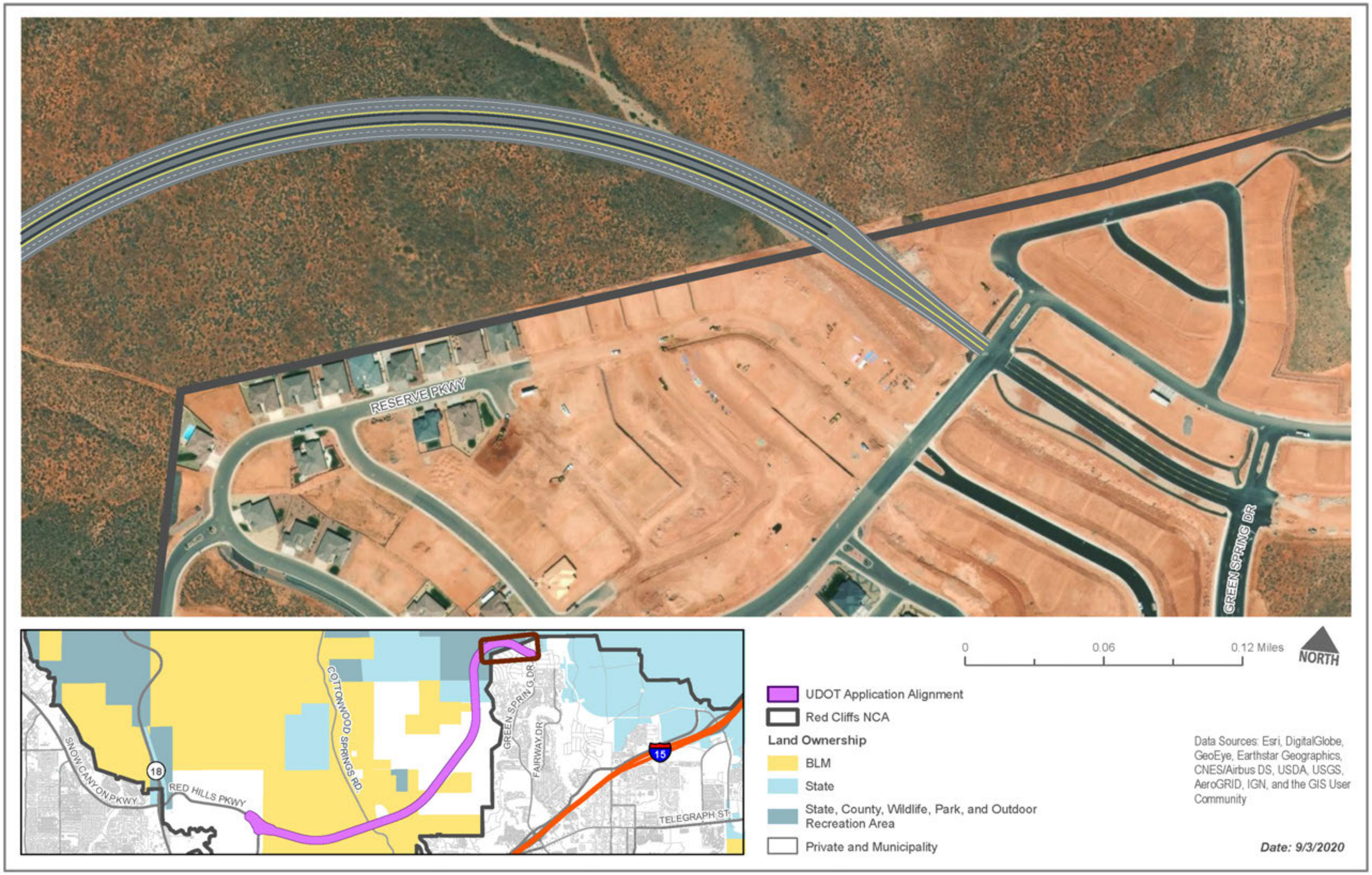


Figure 8i. UDOT Application Alignment Plan View (9 of 9)

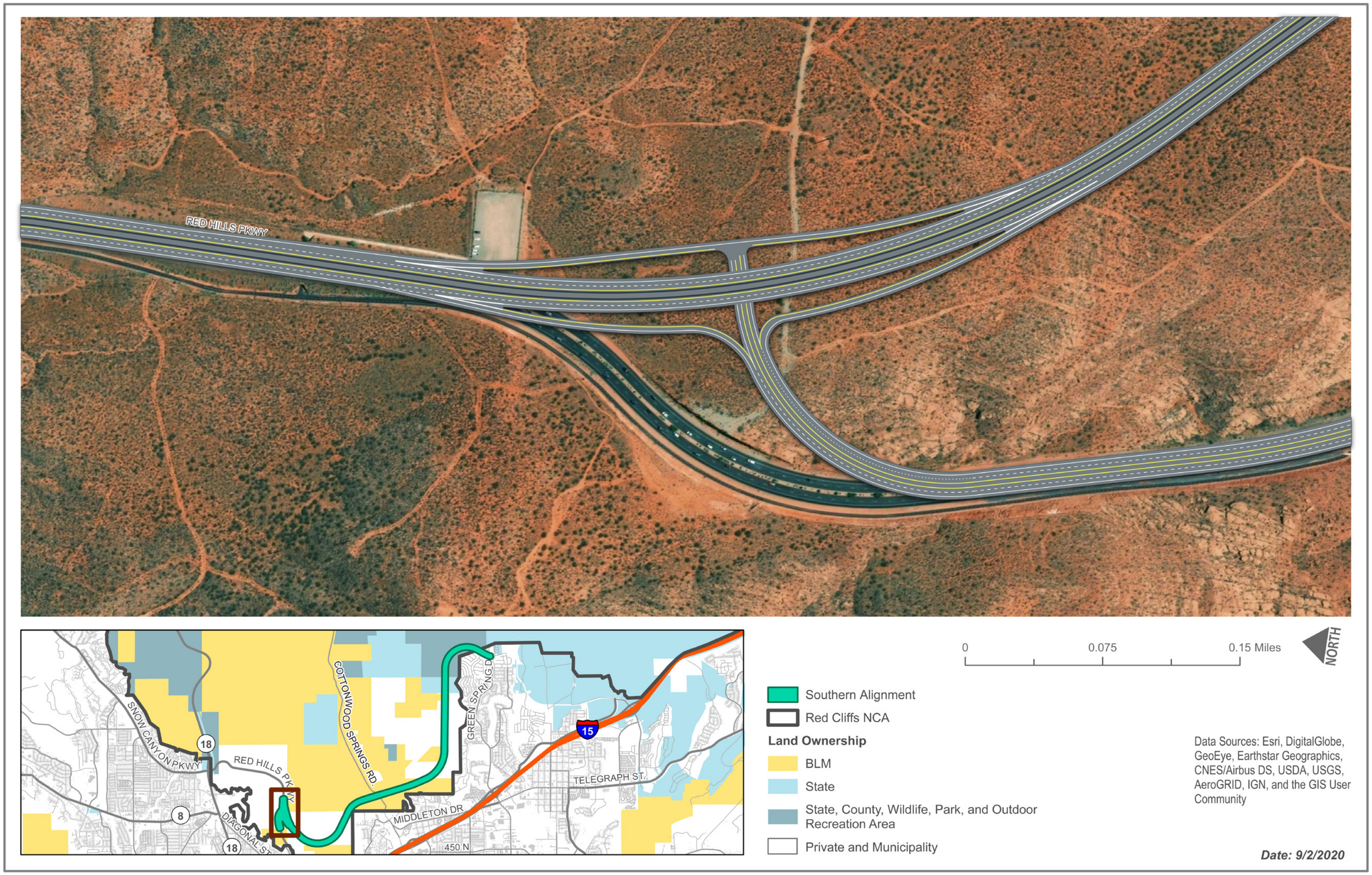


Figure 9a. Southern Alignment Plan View (1 of 11)

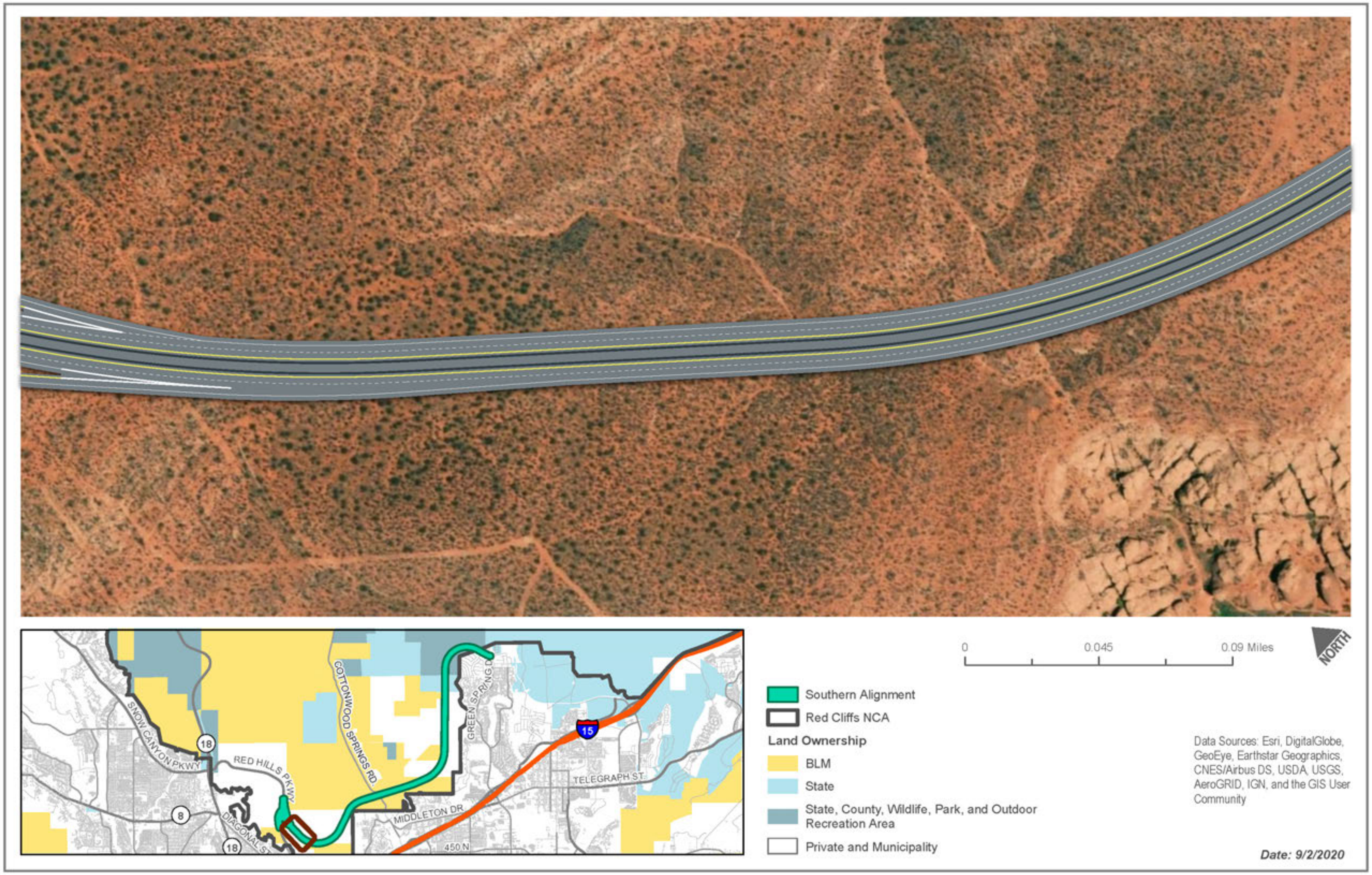


Figure 9b. Southern Alignment Plan View (2 of 11)

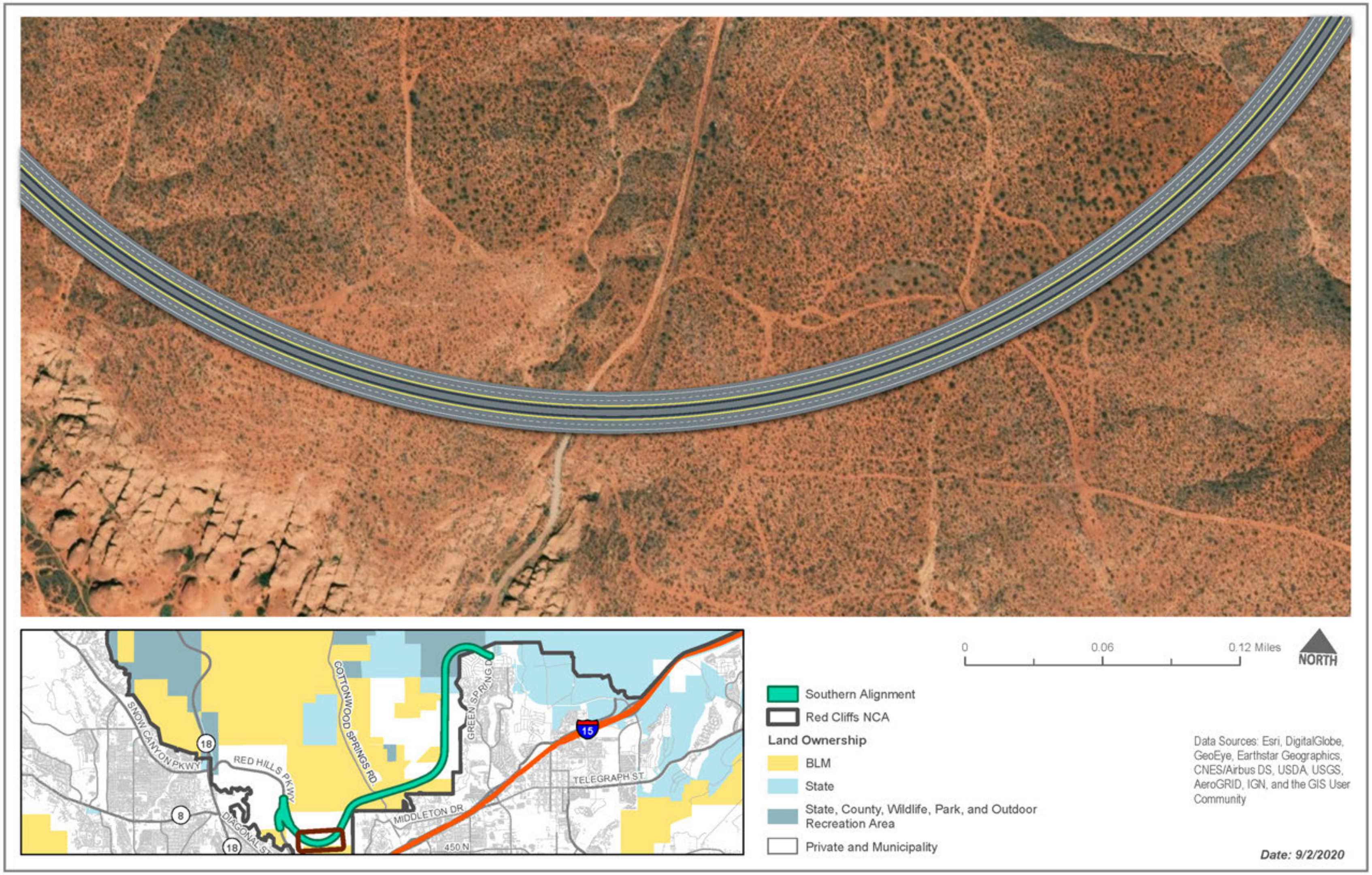


Figure 9c. Southern Alignment Plan View (3 of 11)

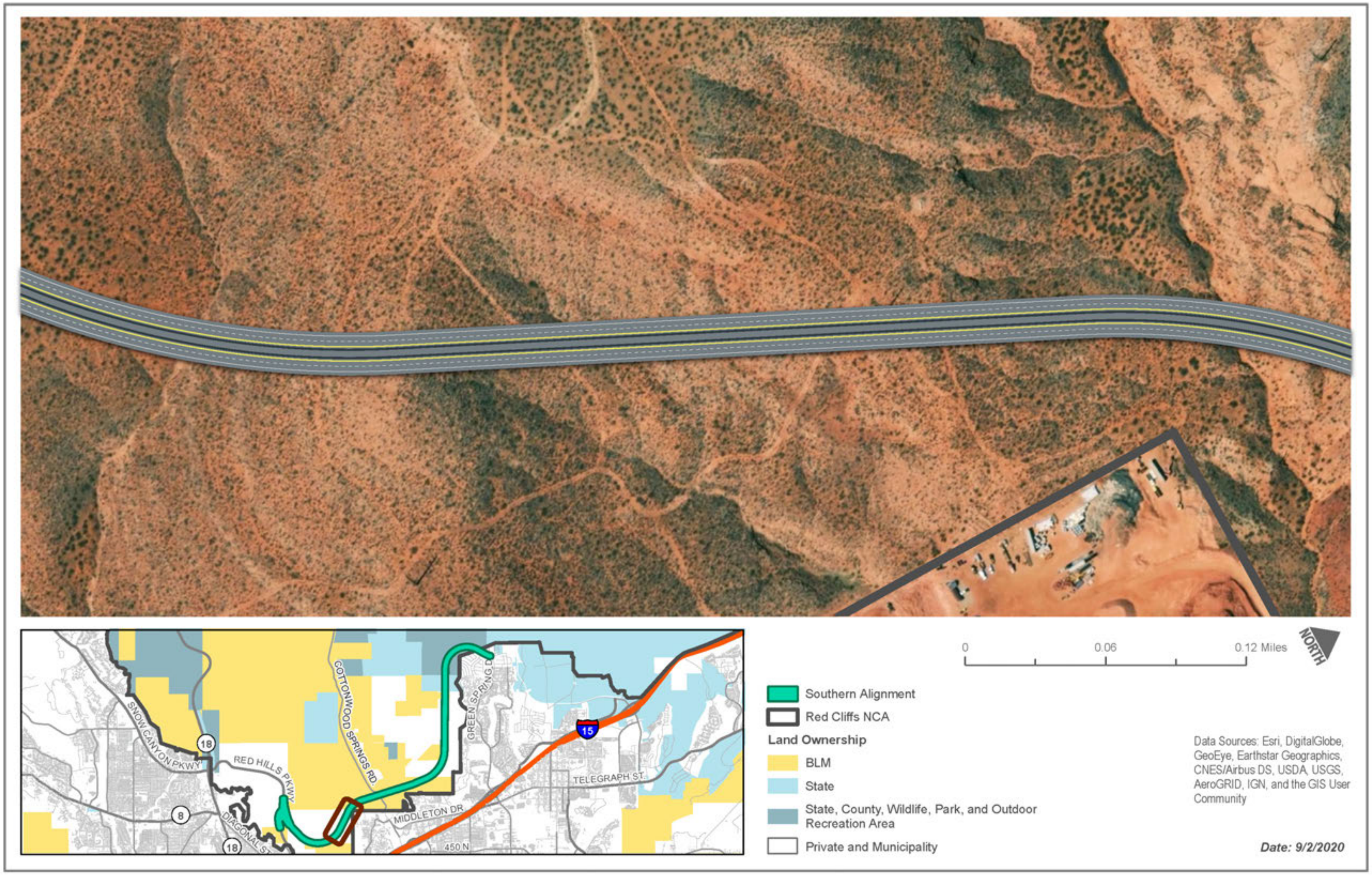


Figure 9d. Southern Alignment Plan View (4 of 11)

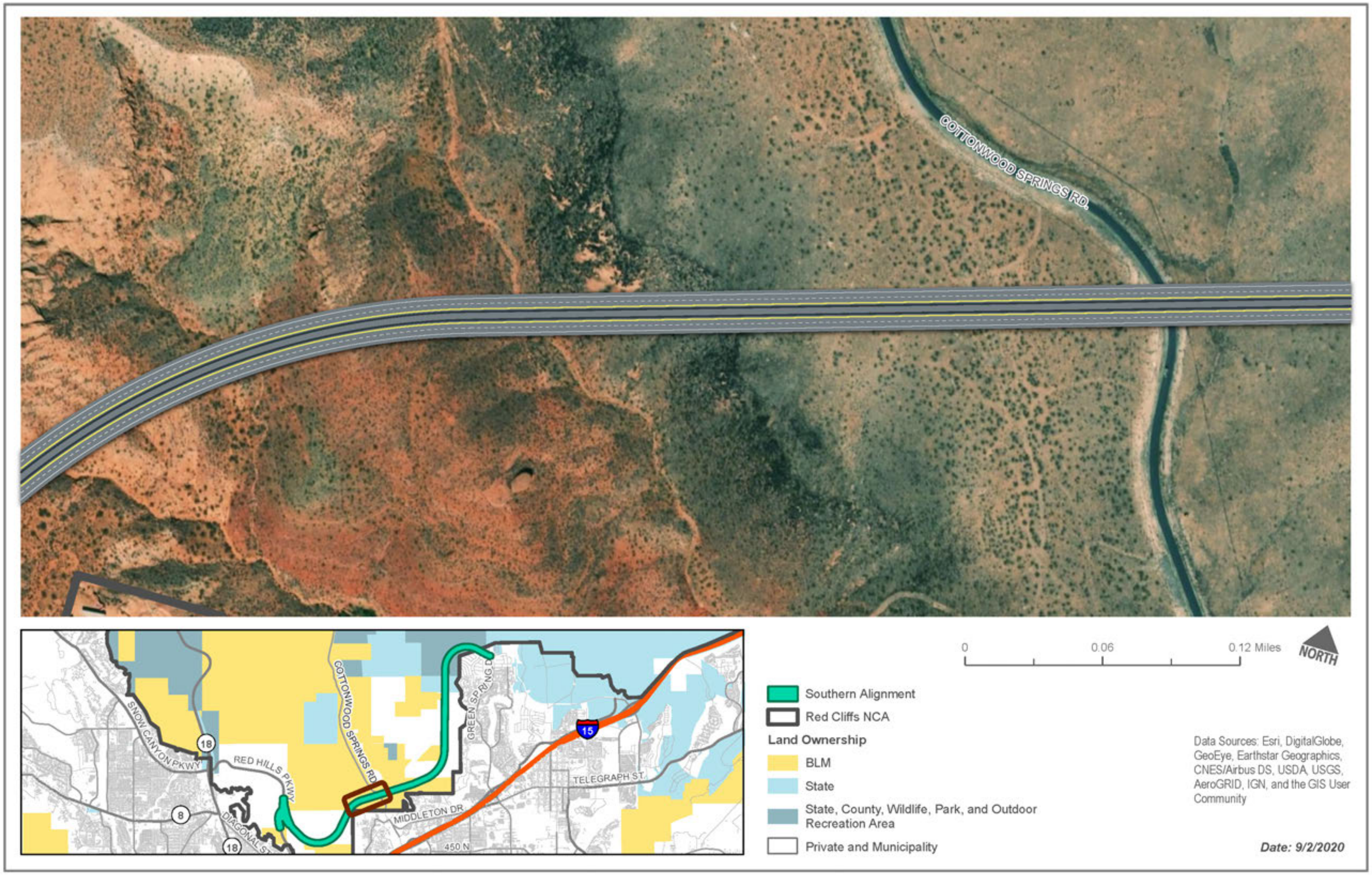


Figure 9e. Southern Alignment Plan View (5 of 11)

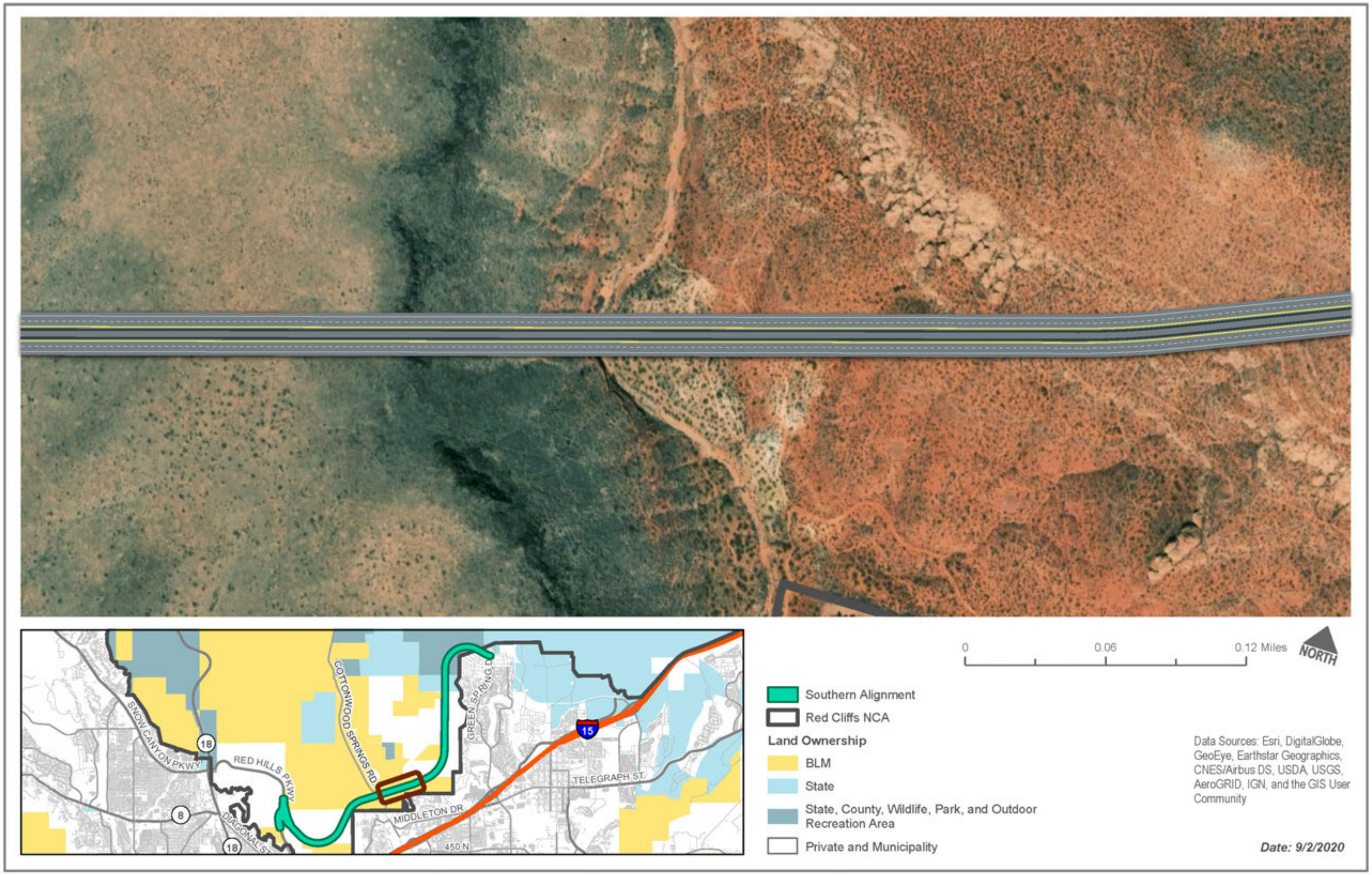


Figure 9f. Southern Alignment Plan View (6 of 11)

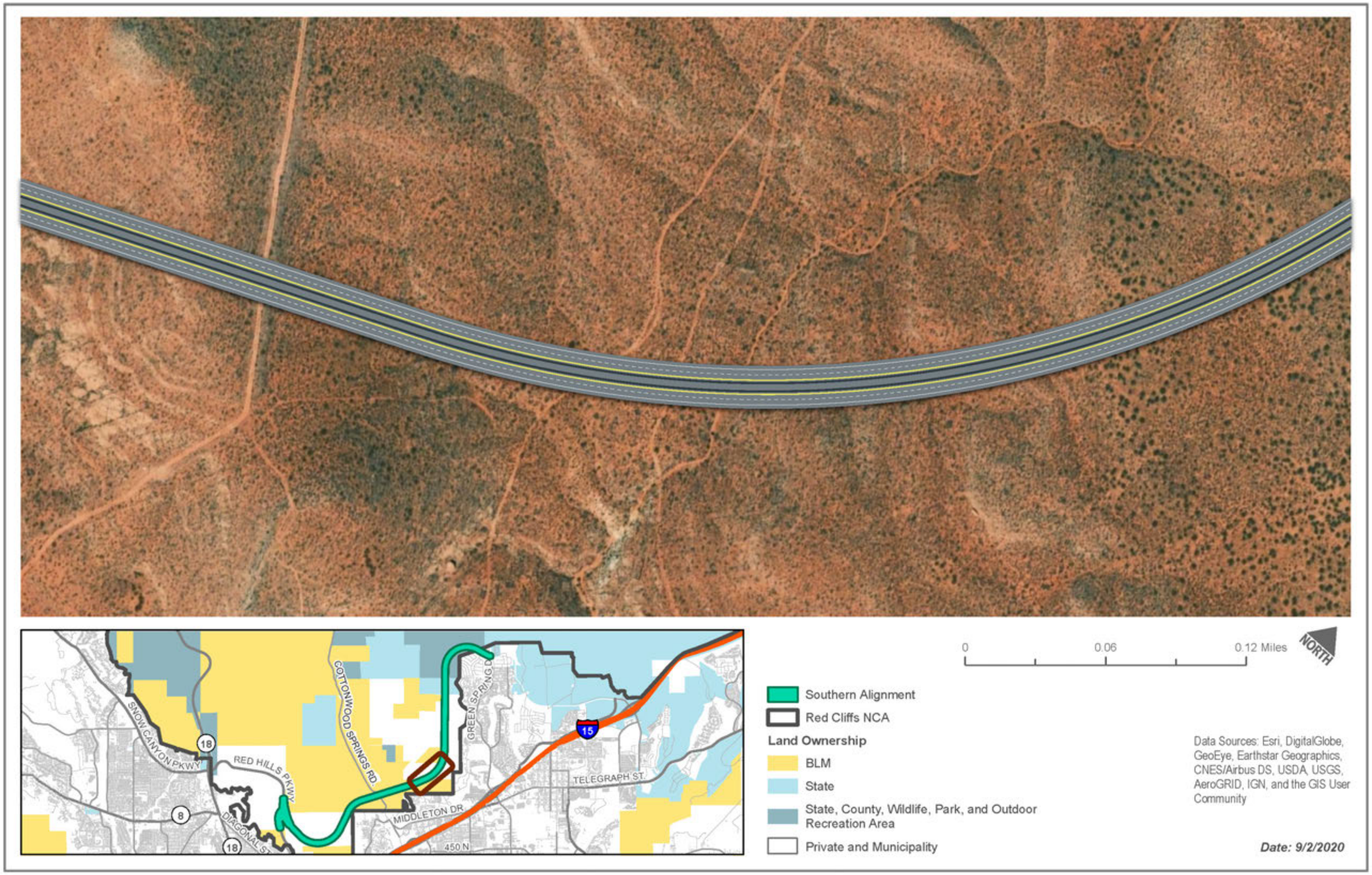


Figure 9g. Southern Alignment Plan View (7 of 11)

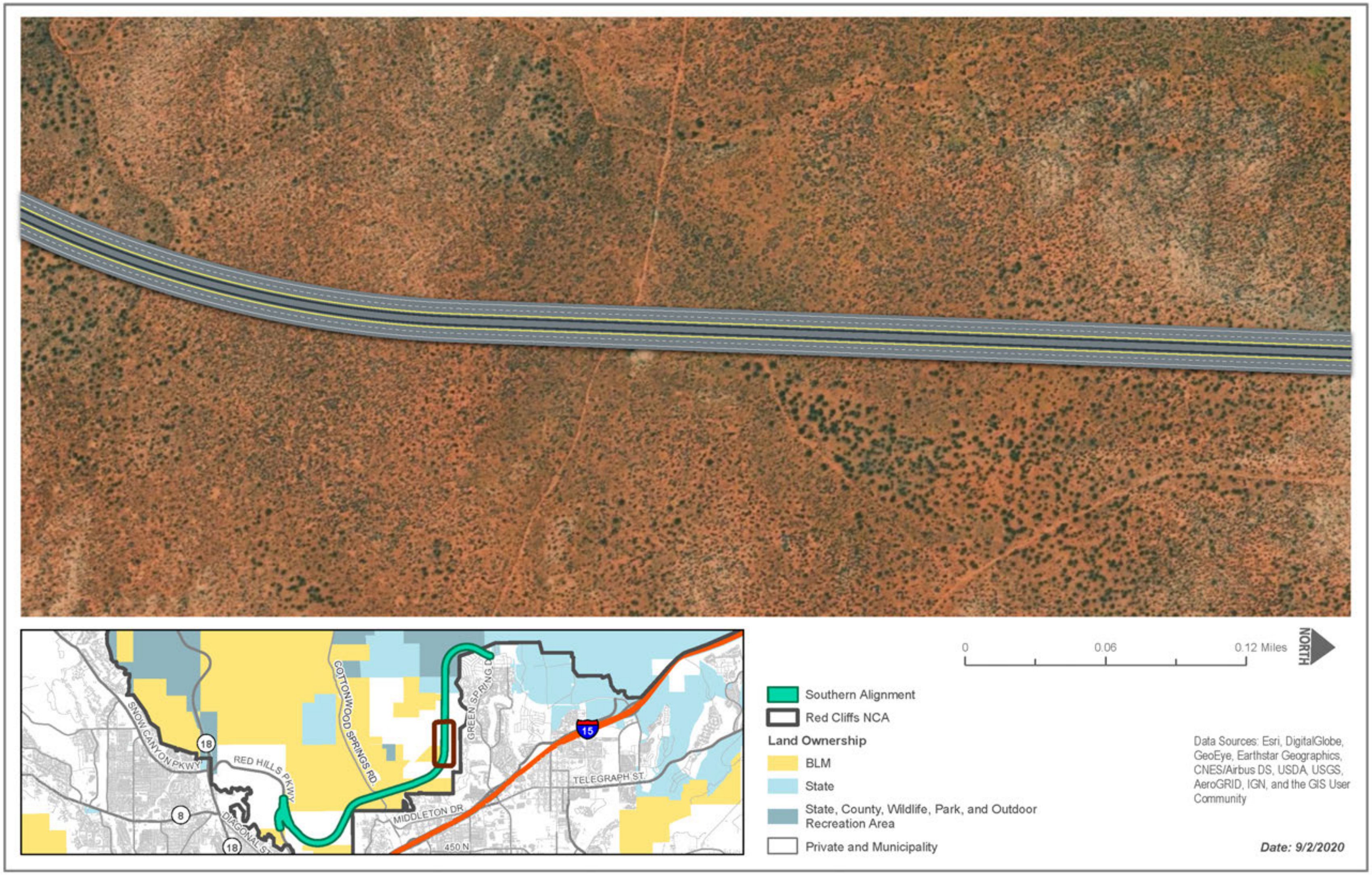


Figure 9h. Southern Alignment Plan View (8 of 11)

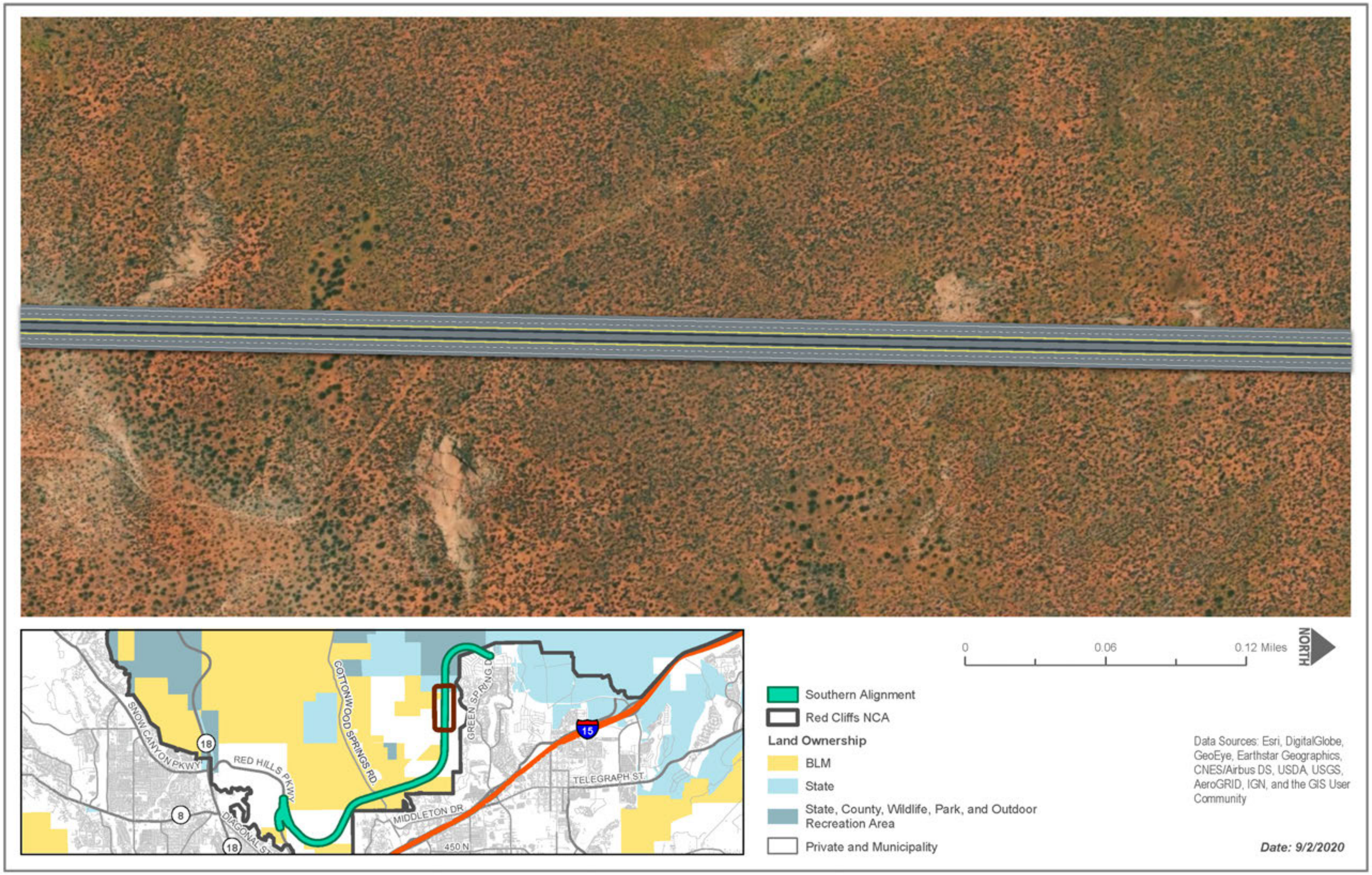


Figure 9i. Southern Alignment Plan View (9 of 11)

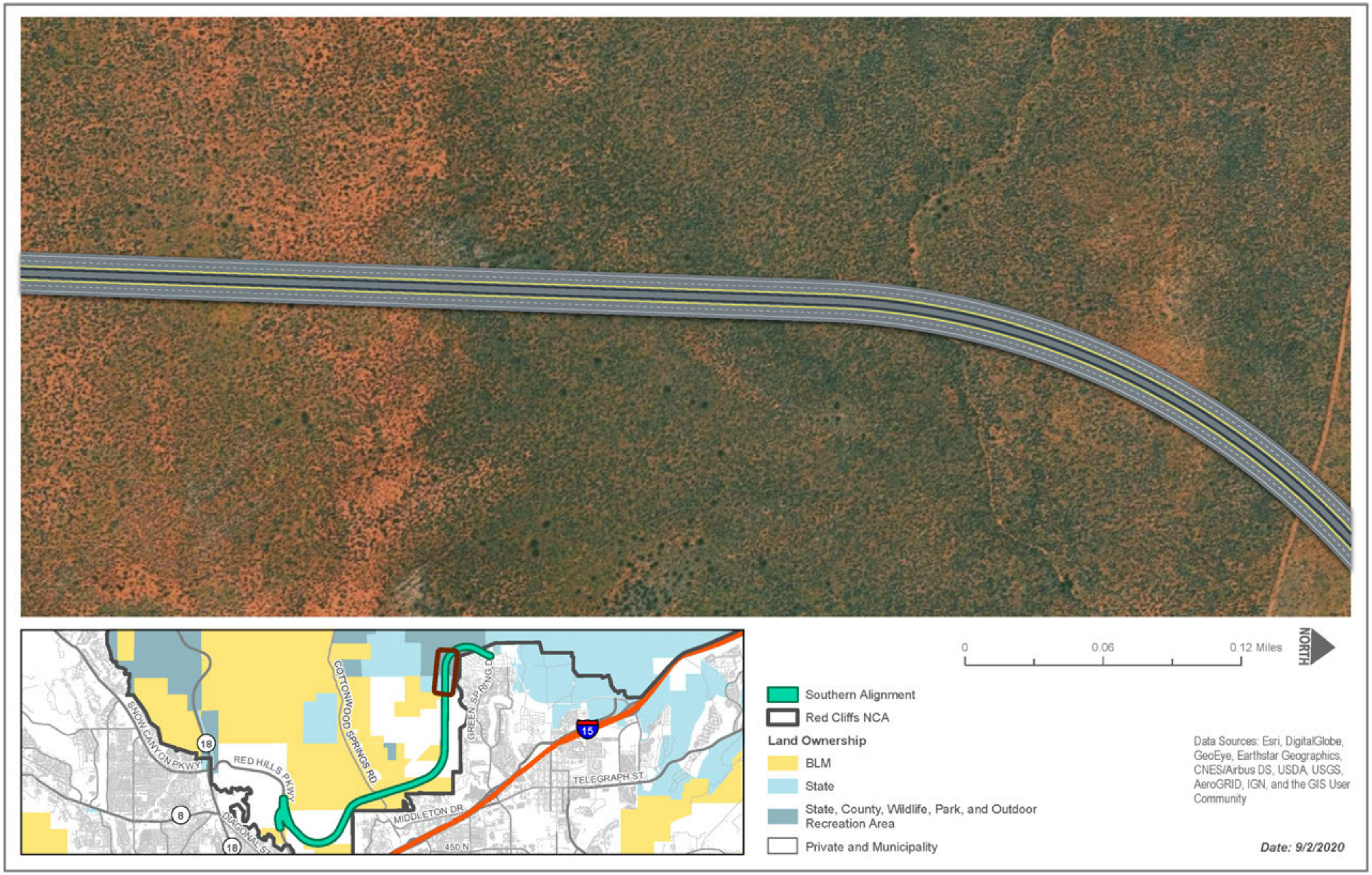


Figure 9j. Southern Alignment Plan View (10 of 11)

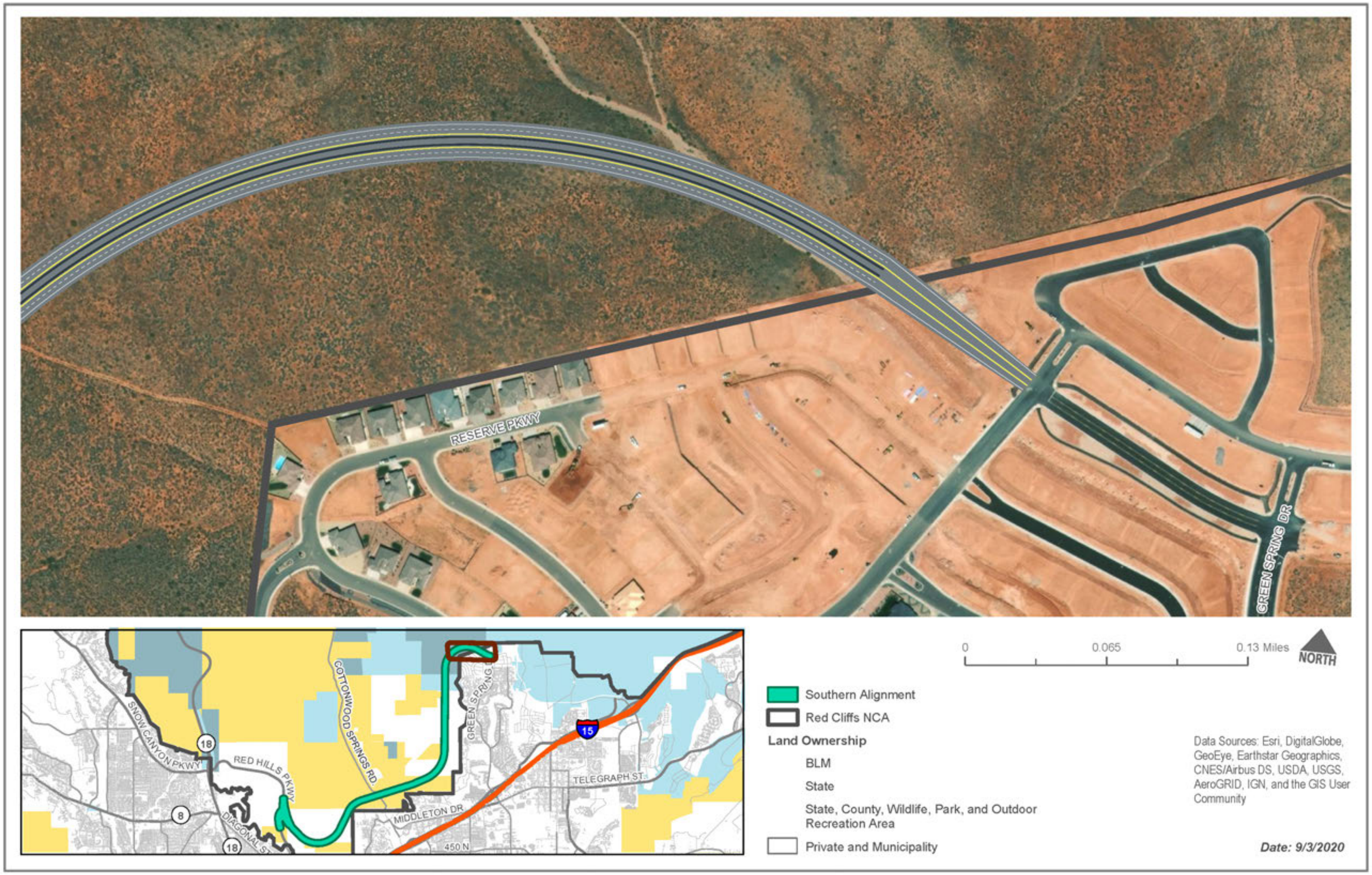


Figure 9k. Southern Alignment Plan View (11 of 11)

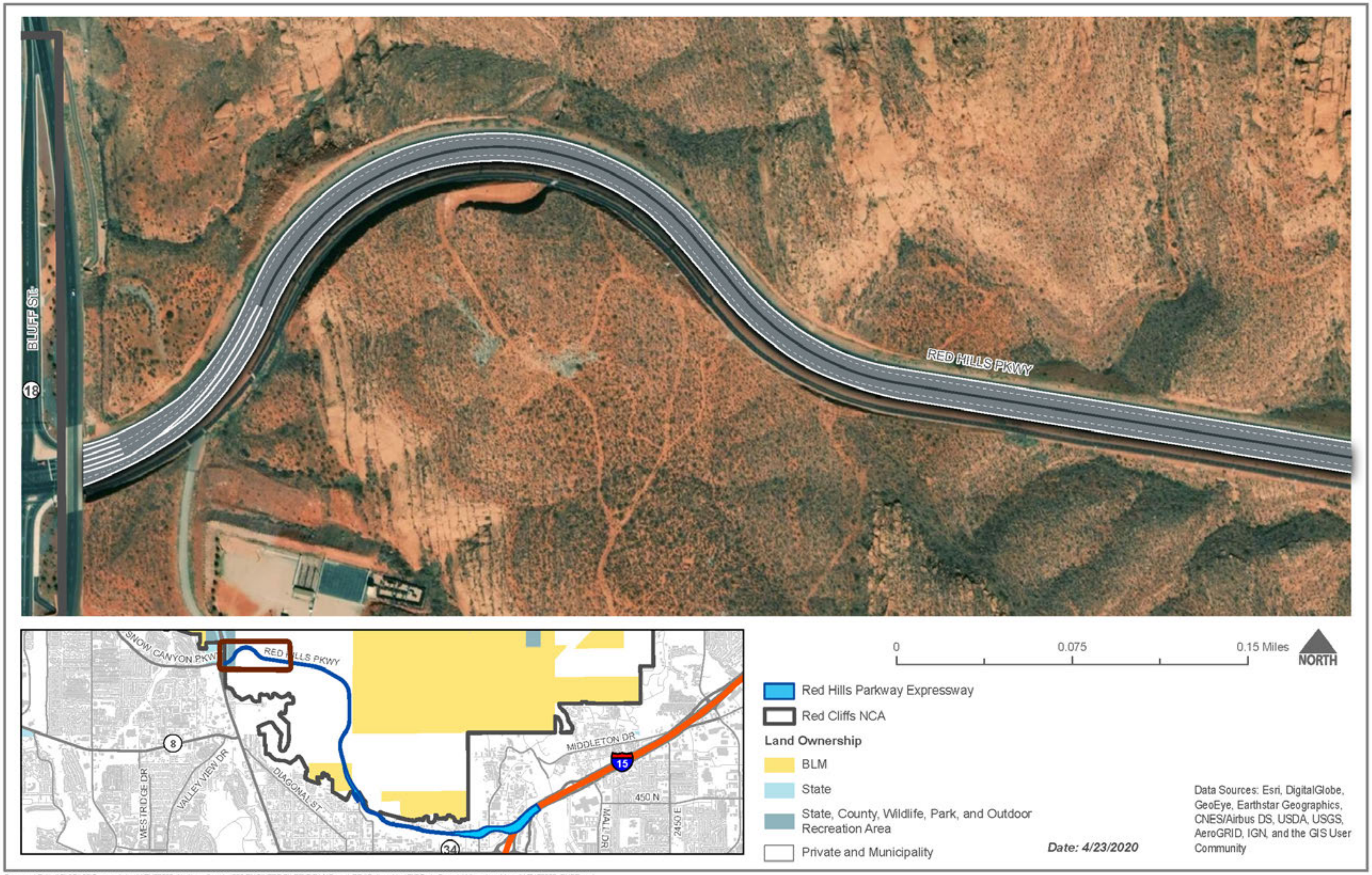


Figure 10a. Red Hills Parkway Expressway Plan View (1 of 7)

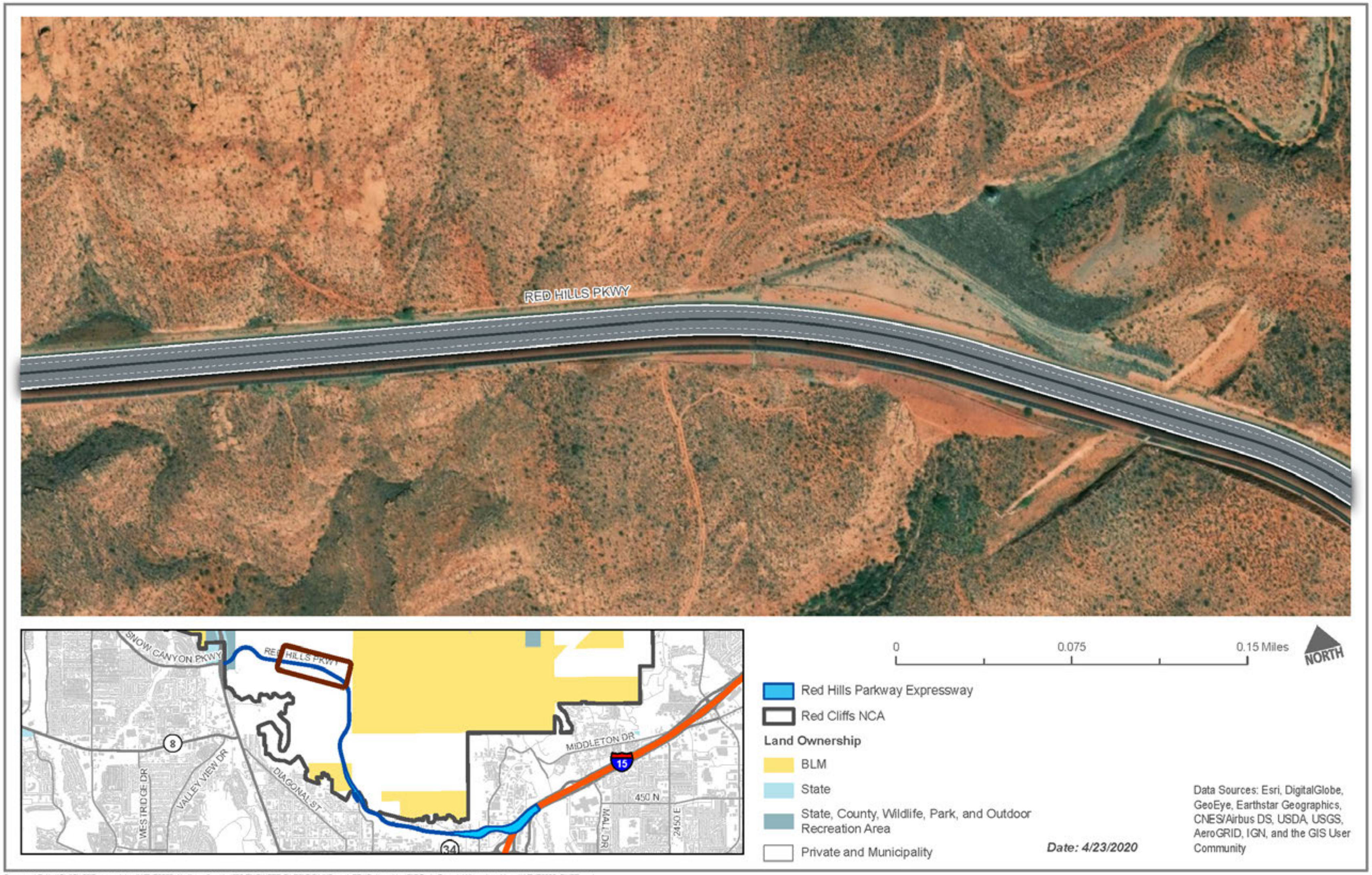


Figure 10b. Red Hills Parkway Expressway Plan View (2 of 7)

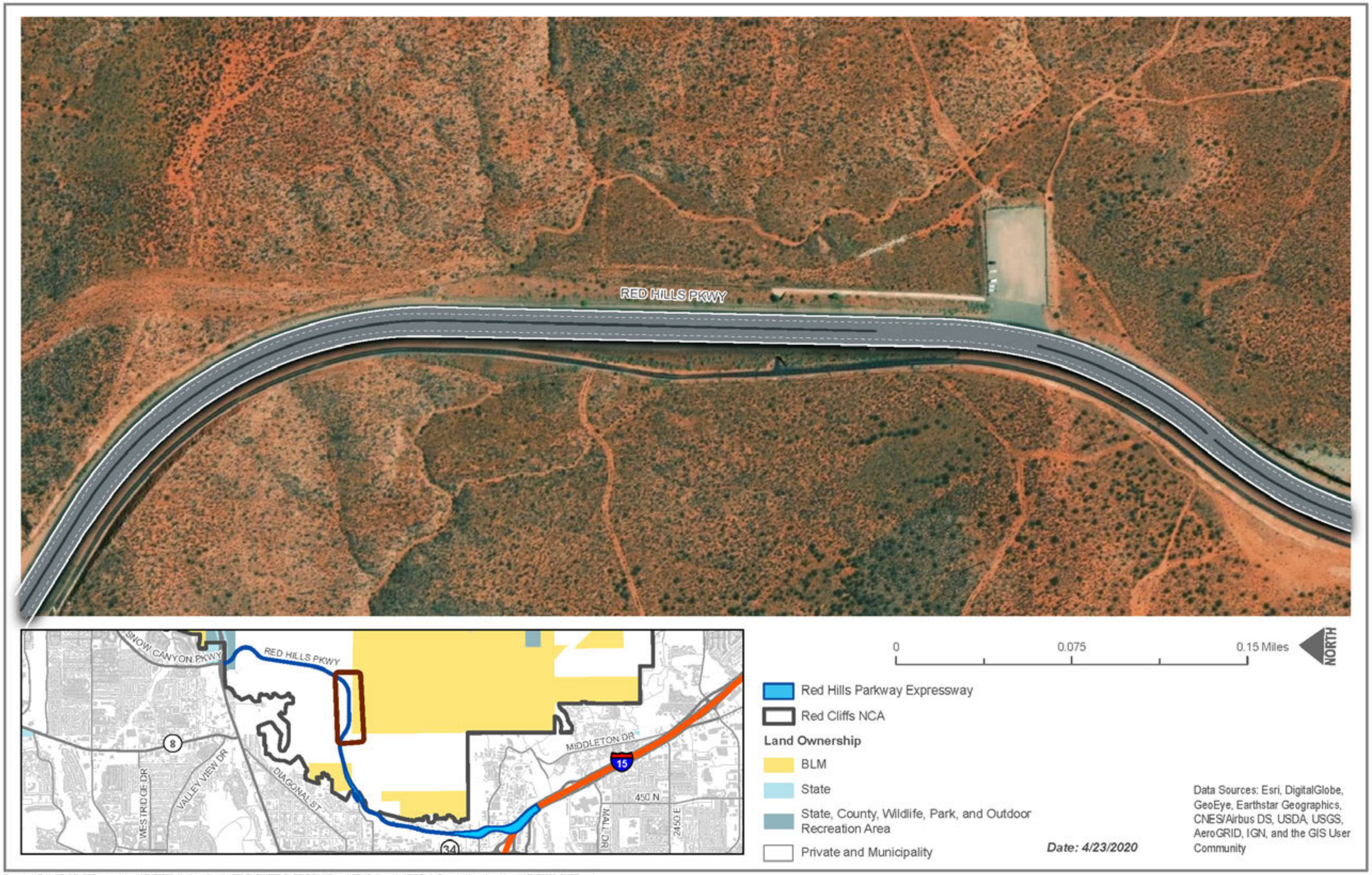


Figure 10c. Red Hills Parkway Expressway Plan View (3 of 7)

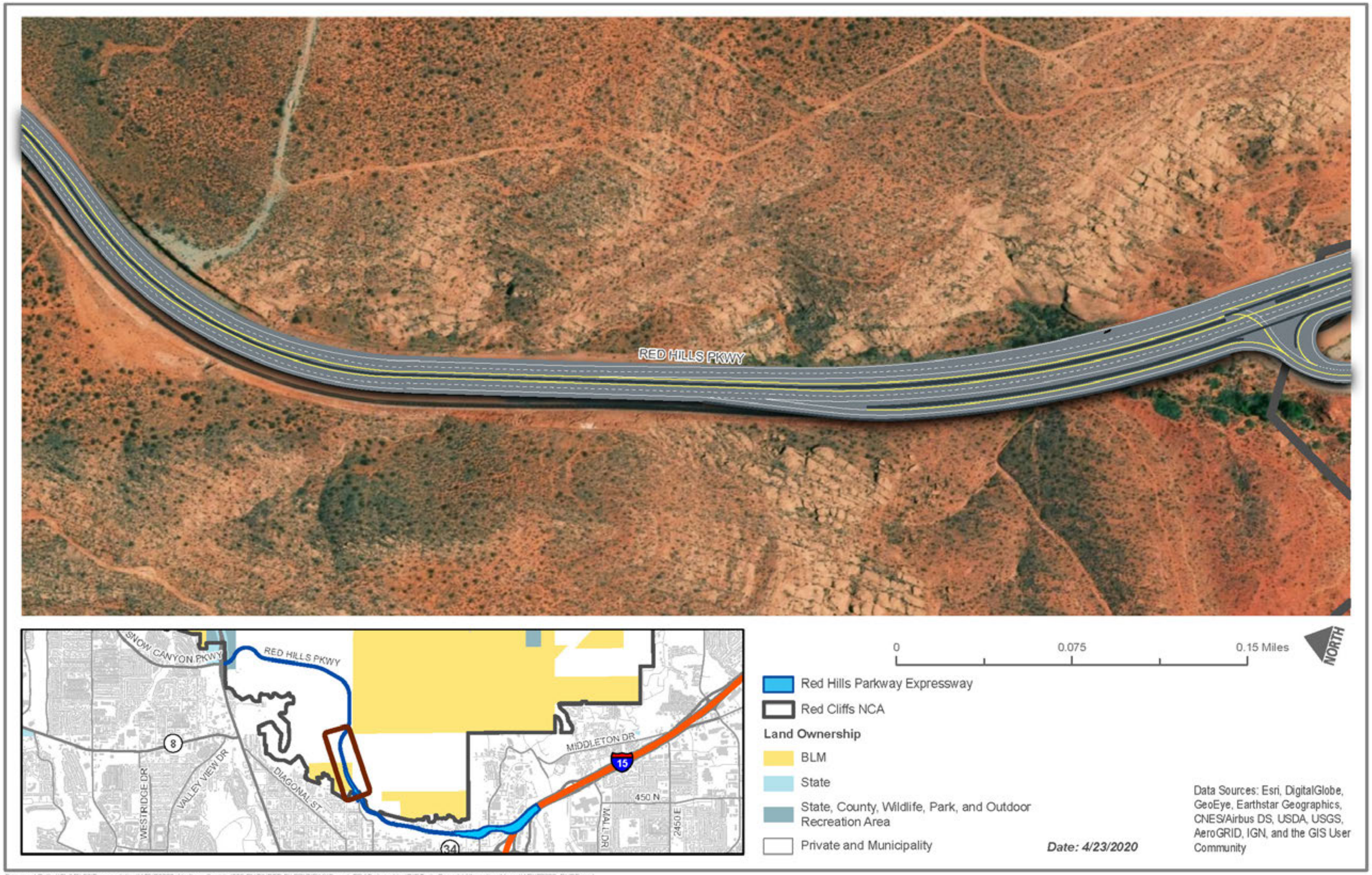


Figure 10d. Red Hills Parkway Expressway Plan View (4 of 7)

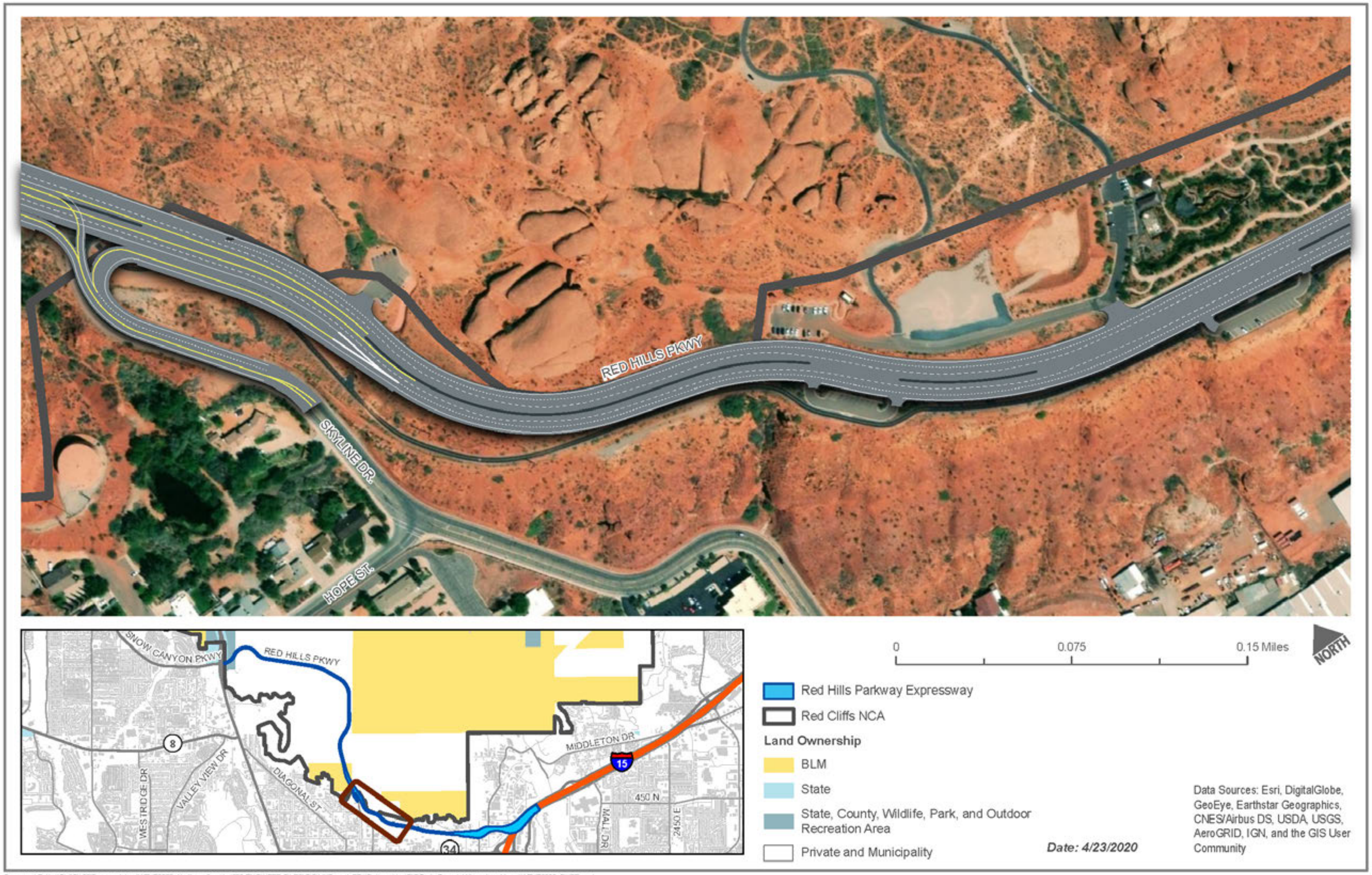


Figure 10e. Red Hills Parkway Expressway Plan View (5 of 7)

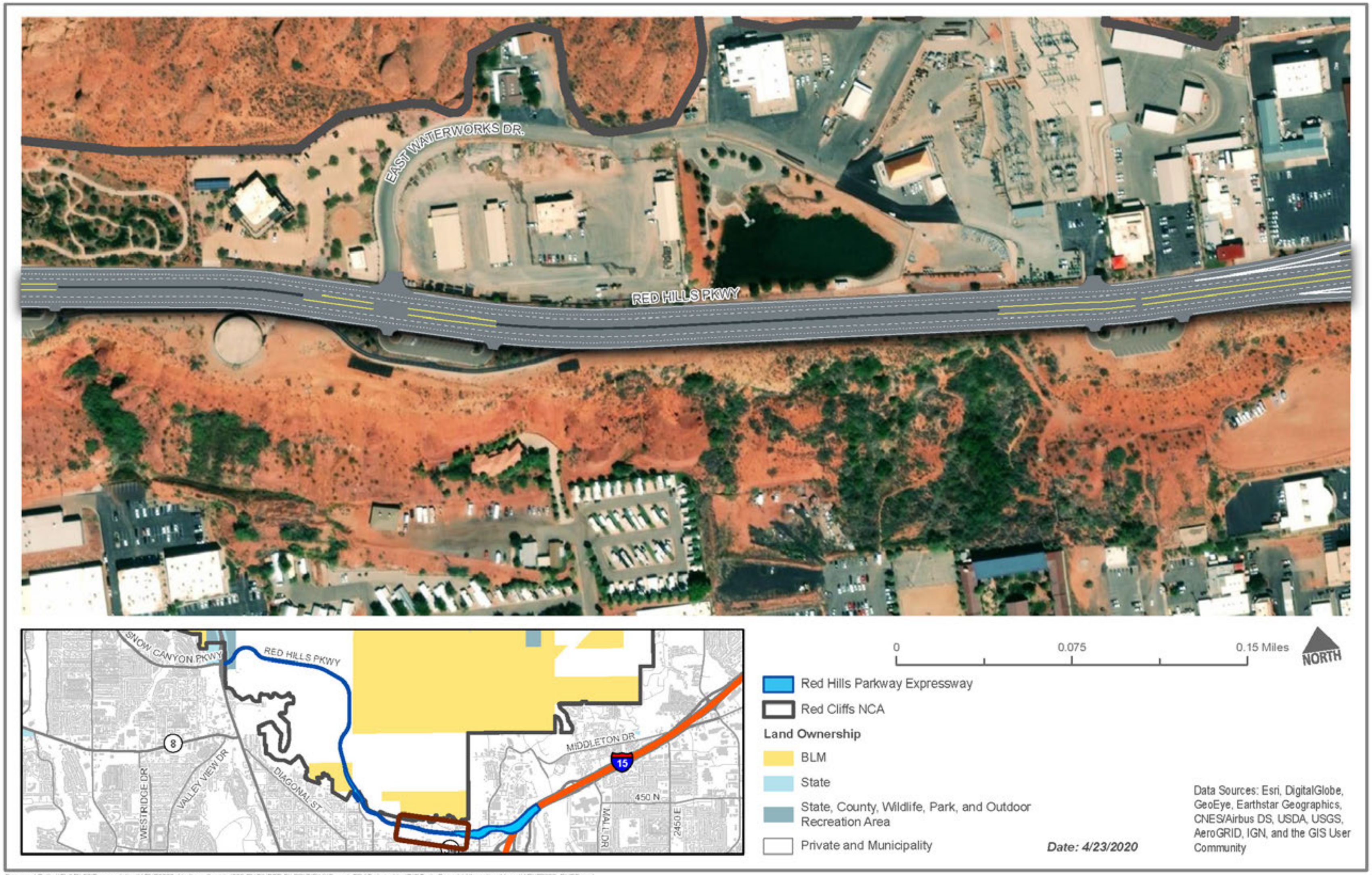


Figure 10f. Red Hills Parkway Expressway Plan View (6 of 7)

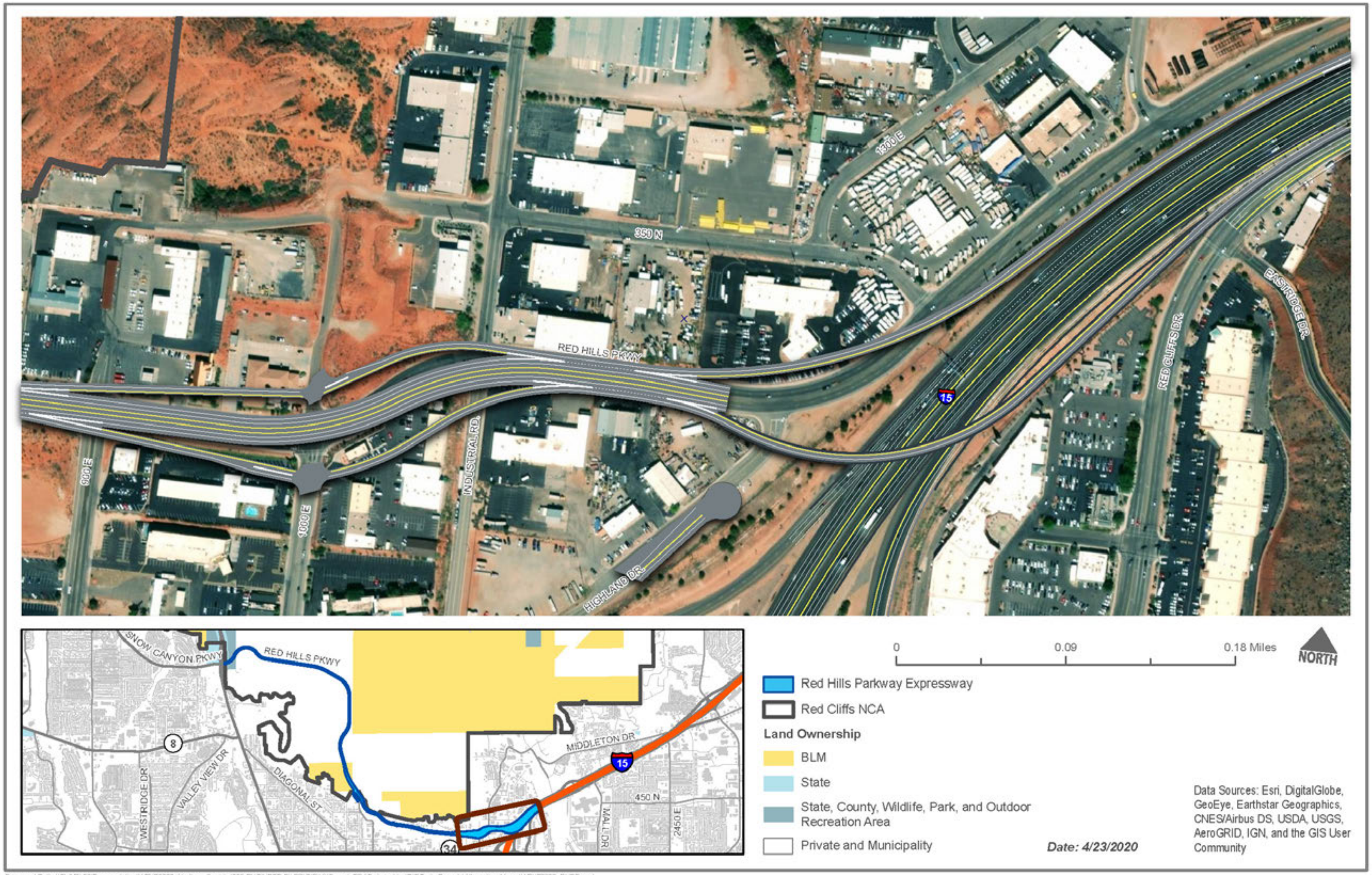


Figure 10g. Red Hills Parkway Expressway Plan View (7 of 7)

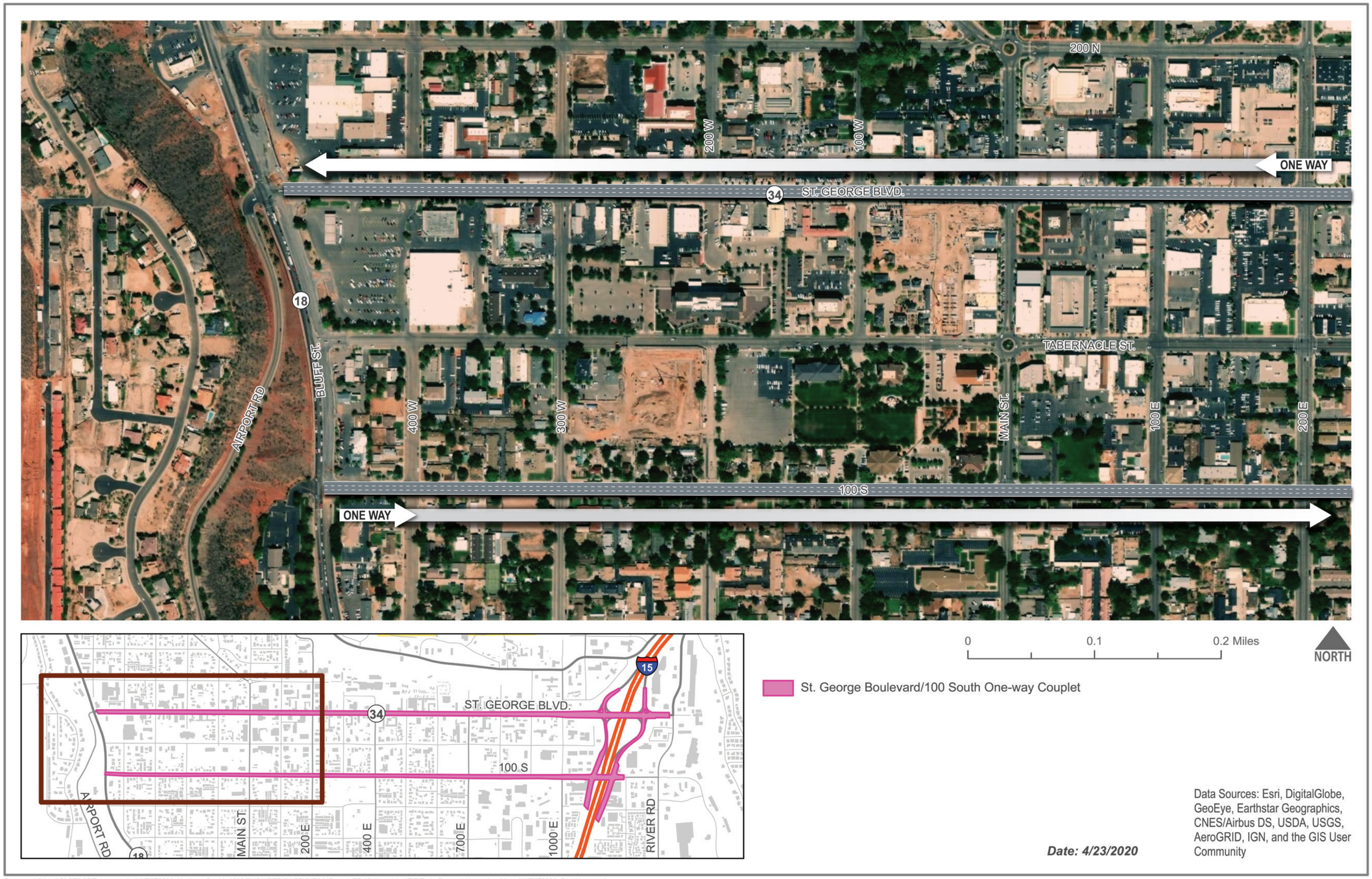


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Figure 11a. St. George Boulevard/100 South One-way Couplet Plan View (1 of 4)

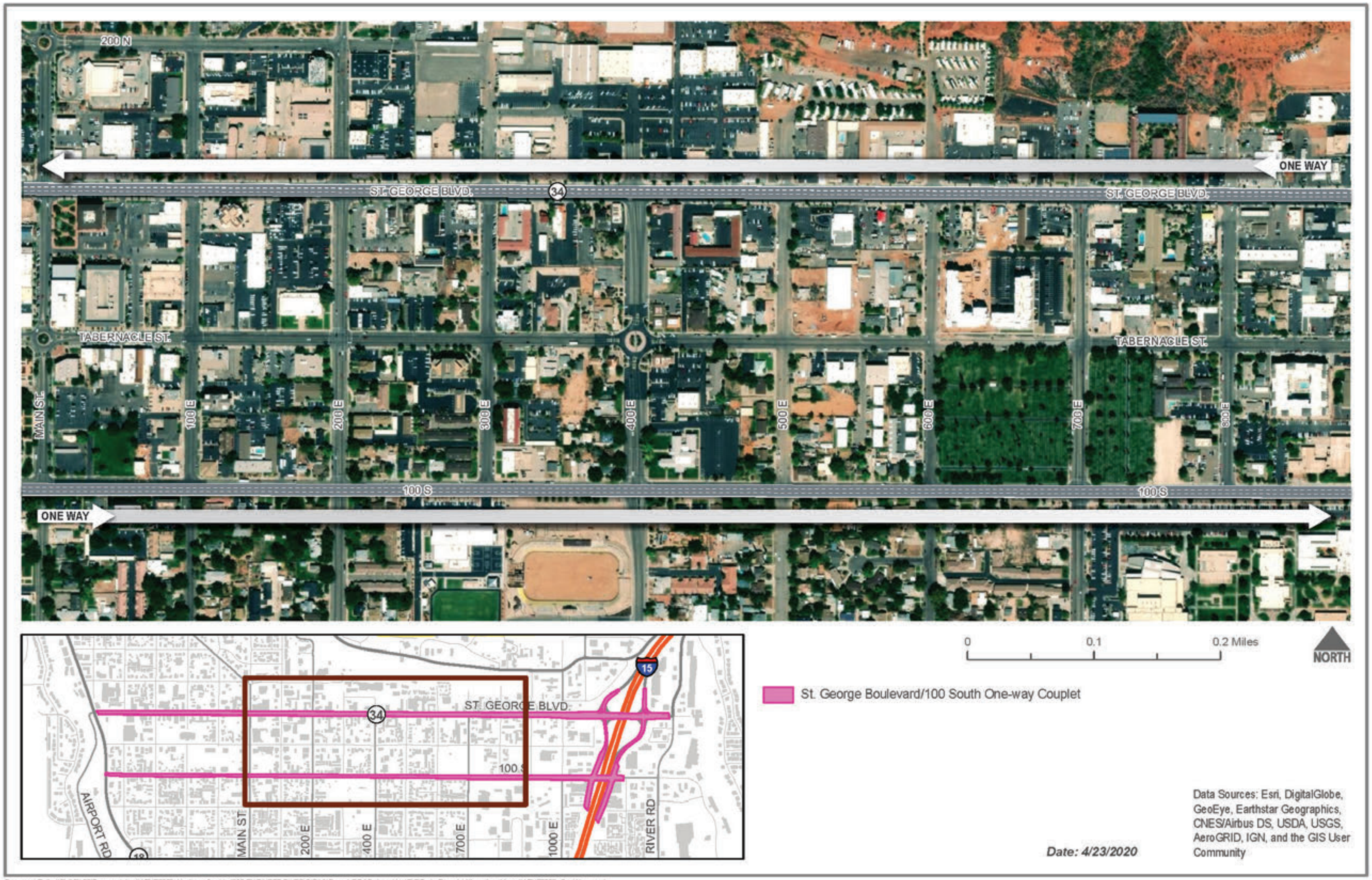

Figure 11b. St. George Boulevard/100 South One-way Couplet Plan View (2 of 4)

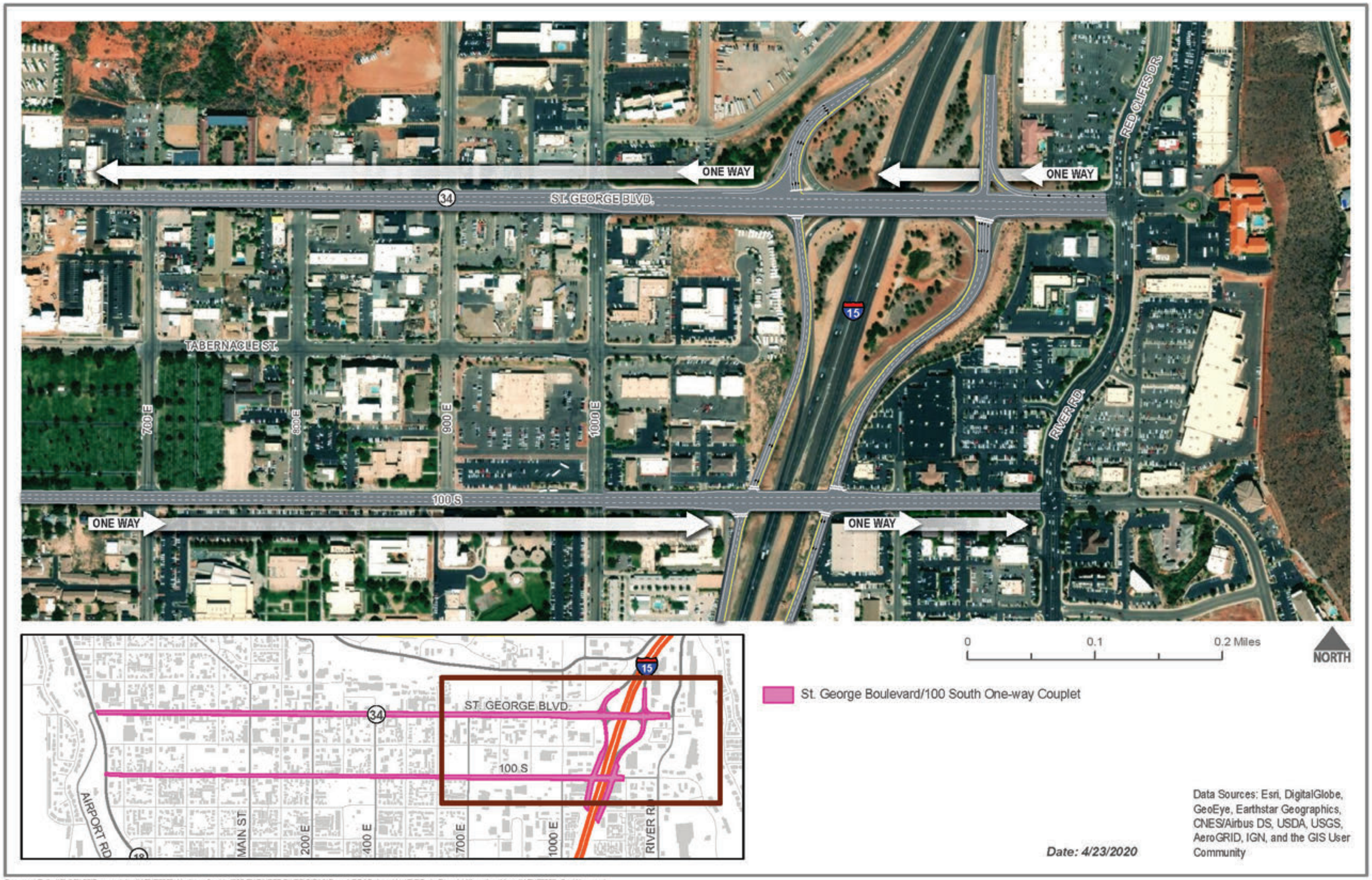

Figure 11c. St. George Boulevard/100 South One-way Couplet Plan View (3 of 4)

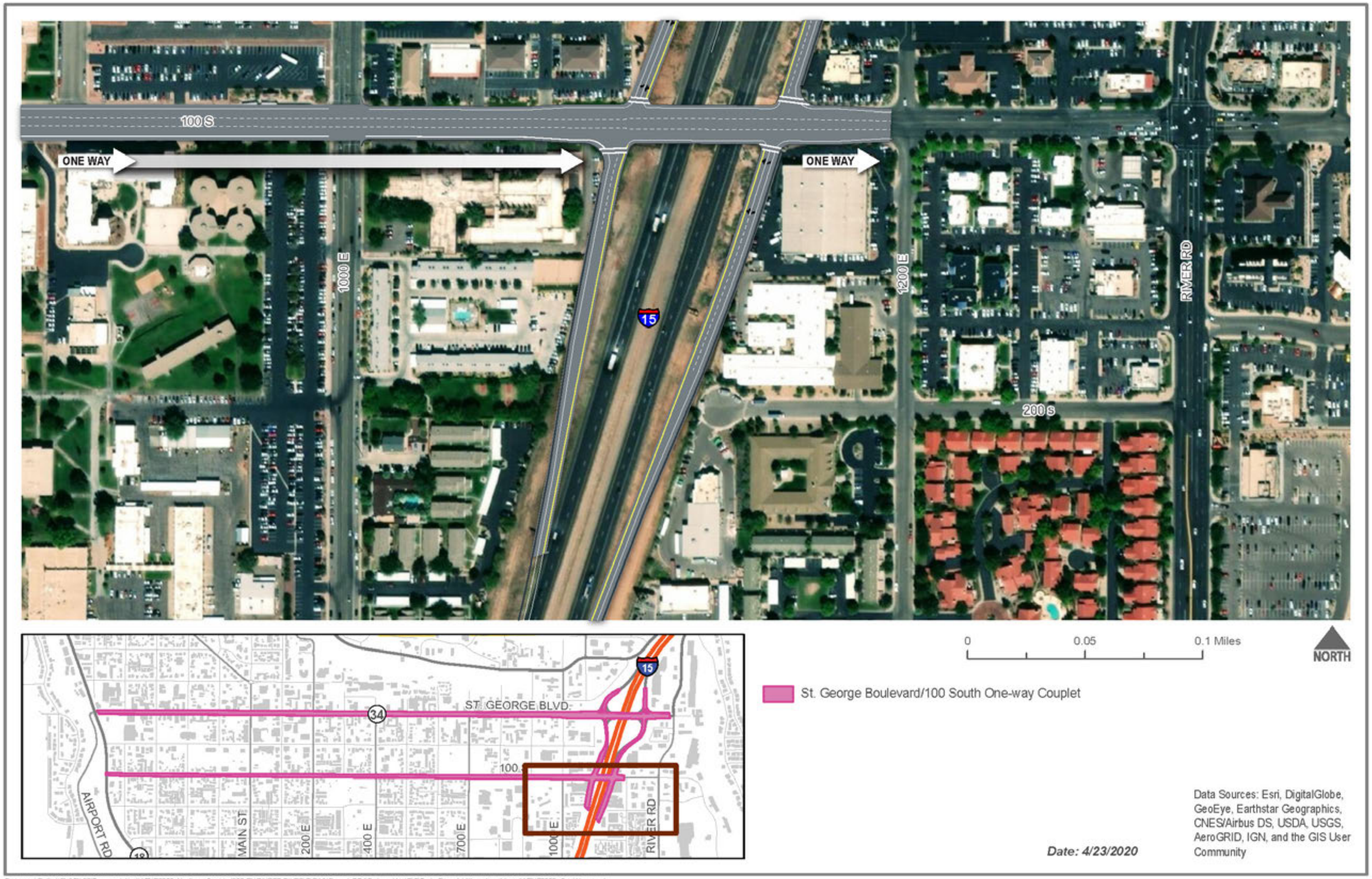

Figure 11d. St. George Boulevard/100 South One-way Couplet Plan View (4 of 4)

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